DOCUMENT RESUME

ED 441 147 CE 080 167

AUTHOR	Licklider, Cheryl
TITLE	Graphic Arts: Orientation, Composition, and Paste-Up. Fourth Edition. Teacher Edition [and] Student Edition.
INSTITUTION	Multistate Academic and Vocational Curriculum Consortium, Stillwater, OK.
PUB DATE	2000-00-00
NOTE	571p.; For other documents in the Graphic Arts Series, see ED 432 677 and ED 435 851. For third edition, see ED 410 416.
AVAILABLE FROM	Multistate Academic and Vocational Curriculum Consortium, 1500 West Seventh Avenue, Stillwater, OK 74074-4364 (Teacher edition, order no. CN801901; Student Edition, order no. CN801902). Tel: 800-654-3988 (Toll-Free); Tel: 405-743-5578; e-mail: mavccweb@okvotech.org; Web site: http://www.mavcc.org.
PUB TYPE	Guides - Classroom - Learner (051) -- Guides - Classroom - Teacher (052)
EDRS PRICE	EDRS Price MF02 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Behavioral Objectives; *Design; *Graphic Arts; Instructional Materials; Job Skills; Laboratory Safety; Learning Activities; Mathematics Instruction; Measurement; *Paper (Material); Postsecondary Education; Secondary Education; Student Evaluation; Teaching Guides; Technology Education; Tests
IDENTIFIERS	Typography

ABSTRACT

This teacher and student edition, the first in a series of instructional materials on graphic communication, consists of orientation information, teacher pages, and student worksheets. The teacher edition contains these introductory pages: use of this publication; training and competency profile; PrintED crosswalk; instructional/task analysis; basic skills icons and classifications; basic skills matrix; and tools, equipment, and materials list. The teacher edition is divided into 11 units: (1) Orientation; (2) Shop Safety; (3) Related Math and Measuring; (4) Shop Organization; (5) Printing Processes; (6) Paper; (7) Typography; (8) Typesetting; (9) Design Principles; (10) Paste-Up Principles and Procedures; and (11) Proof Procedures and Legal Considerations. The units include suggested activities, instructional plans, teaching suggestions, reference lists, lists of suggested supplemental resources, instructions for evaluating student performance on assignments and job sheets, answers to assignment sheets, written tests, test answer keys, learning activity sheets to be completed by students, models for teachers to use in self-paced or individualized programs, and transparency masters. The student edition provides materials for each unit, including objective sheets, information sheets, student supplements, assignment sheets, and job sheets. (YLB)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 441 147

Graphic Arts: Orientation, Composition, and Paste-Up. Fourth Edition. Teacher Edition [and] Student Edition.

Licklider, Cheryl

Multistate Academic and Vocational Curriculum Consortium
1500 West Seventh Avenue
Stillwater, OK 74074-4364

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
● Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

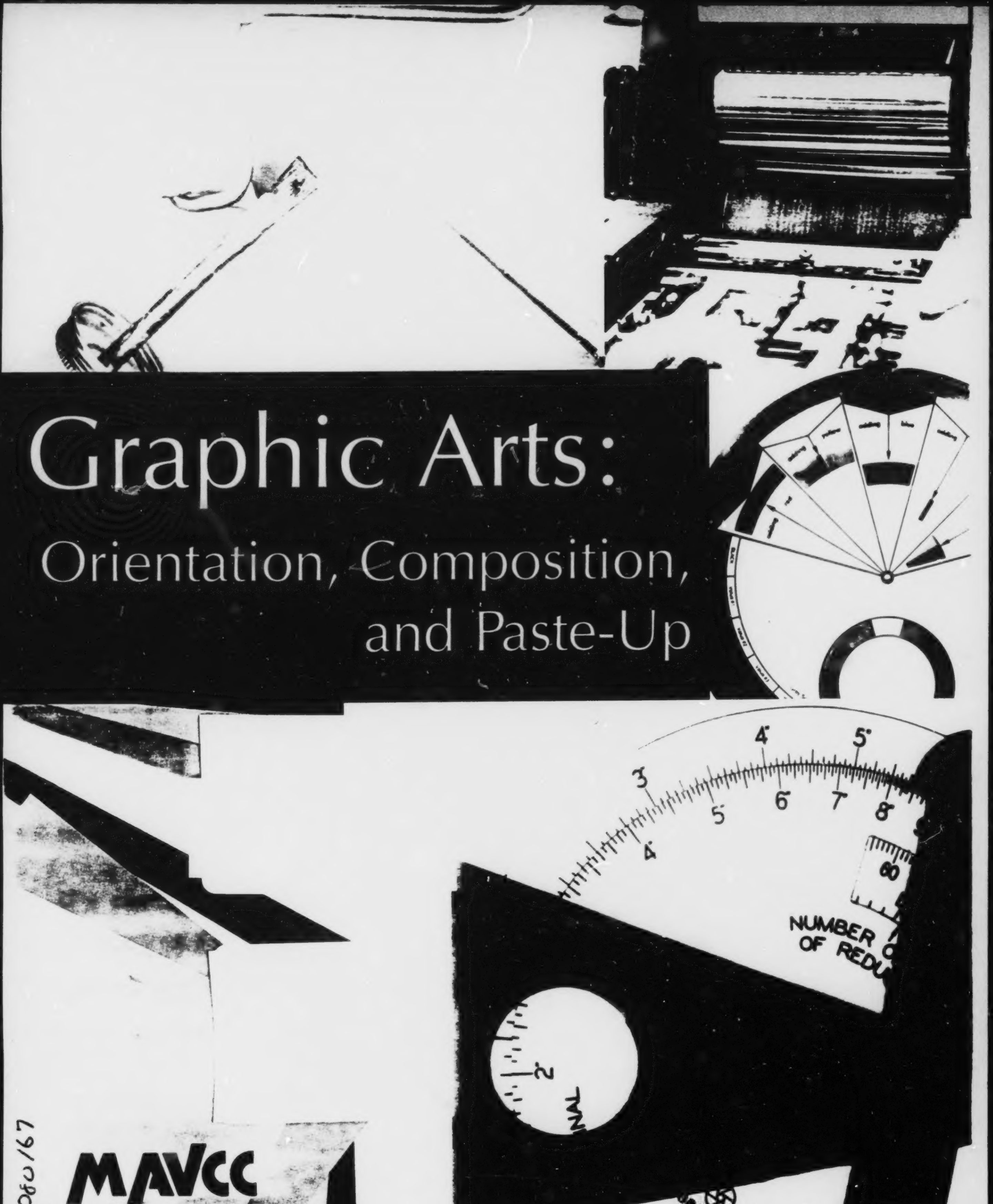
A. Pratt

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2B

CE080167

2


3
4
5
4
5
6
7
8
60
NUMBER OF REDU
2
SIZE
GRAPHIC SUPPLIES
2A

Graphic Arts:

Orientation, Composition, and Paste-Up

CE 080 167

MAVCC

Teacher Edition

00-14365 CN801901

BEST COPY AVAILABLE

Graphic Arts

Orientation, Composition, and Paste-Up

Fourth Edition

Teacher Edition

Revised by

Cheryl Licklider

Project coordinated by

Cheryl Barr

Developed by

The Multistate Academic and Vocational Curriculum Consortium, Inc.

Board of Directors

Emmett Eary, Texas, Chair
John Davidson, Arkansas
Jimmy Hogg, Georgia
Jim Fleihler, Iowa
Ben Clay, Kansas
Mervin Birdwell, Louisiana
Dana Tannehill, Missouri
Kimberly Sadler, Oklahoma
Larry Nelson, South Dakota
Lynne Cohen, Tennessee

Clark R. Harris, Executive Director

©2000 by the Multistate Academic and Vocational Curriculum Consortium, Inc.

All rights reserved. No part of this book may be reproduced in any form or by any means without written permission from the publisher unless otherwise specified.

Printed in the United States of America by the
Oklahoma Department of Vocational-Technical Education
Stillwater, OK 74074-4364

For more information, contact the
Multistate Academic and Vocational Curriculum Consortium
1500 West Seventh Avenue
Stillwater, OK 74074-4364

E-mail: mavccweb@okvotech.org
Internet: http://www.mavcc.org
Phone: (800)654-3988 or (405)743-5578

The Multistate Academic and Vocational Curriculum Consortium does not discriminate on the basis of race, creed, color, national origin, sex, age, religion, veteran status, or qualified handicap.

Table of Contents

Introductory Pages

Foreword v
Acknowledgments vii
Use of this publication ix
Training and competency profile xvii
PrintED crosswalk xxi
Instructional/task analysis xxxiii
Basic skills icons and classifications xxxix
Basic skills matrix xli
Tools, equipment, and materials list lvii

Units of Instruction

Unit 1: Orientation
Unit 2: Shop Safety
Unit 3: Related Math and Measuring
Unit 4: Shop Organization
Unit 5: Printing Processes
Unit 6: Paper
Unit 7: Typography
Unit 8: Typesetting
Unit 9: Design Principles
Unit 10: Paste-Up Principles and Procedures
Unit 11: Proof Procedures and Legal Considerations

5

Foreword

Graphic Arts: Orientation, Composition, and Paste-Up is the first in a series of instructional materials on graphic communication developed by the Multistate Academic and Vocational Curriculum Consortium (MAVCC). This publication addresses the new technologies that are changing the printing industry and introduces basic concepts and skills necessary for a student to be employed in an entry-level graphic communication occupation.

Additional publications in the graphic arts series are as follows:

- *Graphic Arts: Process Camera, Stripping, and Platemaking*—Revision
- *Graphic Arts: The Press and Finishing Processes*—Revision
- *Graphic Arts: Electronic Prepress and Publishing*—New

Please contact us concerning the availability of these products.

MAVCC's graphic arts series aligns with the PrintED Accreditation Program administered through Printing Industries of America (PIA). A crosswalk is included aligning this publication with PrintED's introduction to graphic communications tasks and the type section of the digital image preparation task list.

As you use these instructional materials, we hope that you will find that they contribute to the quality of your program. If any problems occur or if you have any suggestions for improvement of the materials, please call or write us.

Emmett Eary, Chair
Board of Directors
Multistate Academic and
Vocational Curriculum
Consortium

Clark R. Harris
Executive Director
Multistate Academic and
Vocational Curriculum
Consortium

6

Acknowledgments

Well-deserved thanks go to the many industry and education representatives who participated as members of MAVCC's graphic arts committees throughout the years. Their assistance in developing and reviewing these instructional materials has been an essential step in MAVCC's development process.

Appreciation is also extended to those individuals who contributed their time and talent to the fourth revision of *Graphic Arts: Orientation, Composition, and Paste-Up*.

1999 Participants

Nancy Anderson Mortensen	Clinton, Iowa
Cinde Smith	Topeka, Kansas
Karen Brady	Baton Rouge, Louisiana
Wayne Merritt	Columbia, Missouri
Tim McCartney	El Reno, Oklahoma
Dale Shackelford	Oklahoma City, Oklahoma
Phil Hooper	Sand Springs, Oklahoma
Steve Mayer	Pierre, South Dakota
Bill Esquilla	Fort Worth, Texas

Special recognition is given to Robert Wegener for revising the first edition, to Dan Crummett for revising the second edition, and to the authors of the original publication—Karim Farajollahi, Gary Ogle, William Reed, and Kenneth Woodcock.

A special thank you to the following companies for providing illustrations that appear in this publication:

Frontier Printers, Stillwater, Oklahoma
Western Paper Company, Oklahoma City, Oklahoma
Carpenter Paper Company, Oklahoma City, Oklahoma

Special appreciation is extended to Stacy Lee for her assistance in electronic publishing and in creating artwork, and to the employees of the Graphics Division of the Oklahoma Department of Vocational and Technical Education for printing this publication.

A final thank you to Cheryl Barr for coordinating this project.

Use of This Publication

Graphic Arts: Orientation, Composition, and Paste-Up is available in both a teacher and student edition. The contents of these materials are tied to measurable and observable learning outcomes that were identified and validated by the graphic arts advisory committee, comprised of business/industry representatives and teachers. Competencies align with the PrintED task list developed by the Printing Industries of America, Inc. (PIA).

Teacher Edition

The complete teacher edition consists of introductory pages, teacher pages, and the student edition. Materials are loose-leaf and three-hole punched and are divided into units of instruction that may be broken into more than one lesson or class period. For added flexibility, each unit is individually numbered beginning with a T for teacher page, followed by the unit number and page number.

Example:

Page 17 of Unit 3 in the teacher pages are represented as T 3–17.

MAVCC—*Graphic Arts: Orientation, Composition, and Paste-Up* T 3–17

Page 1 of Unit 5 in the teacher pages are represented as T 5–1.

MAVCC—*Graphic Arts: Orientation, Composition, and Paste-Up* T 5–1

Pages in the student edition are numbered beginning with the unit number, followed by the page number.

Example:

Page 7 of Unit 5 in the student edition is represented as Page 5–7.

MAVCC—*Graphic Arts: Orientation, Composition, and Paste-Up* Page 5–7

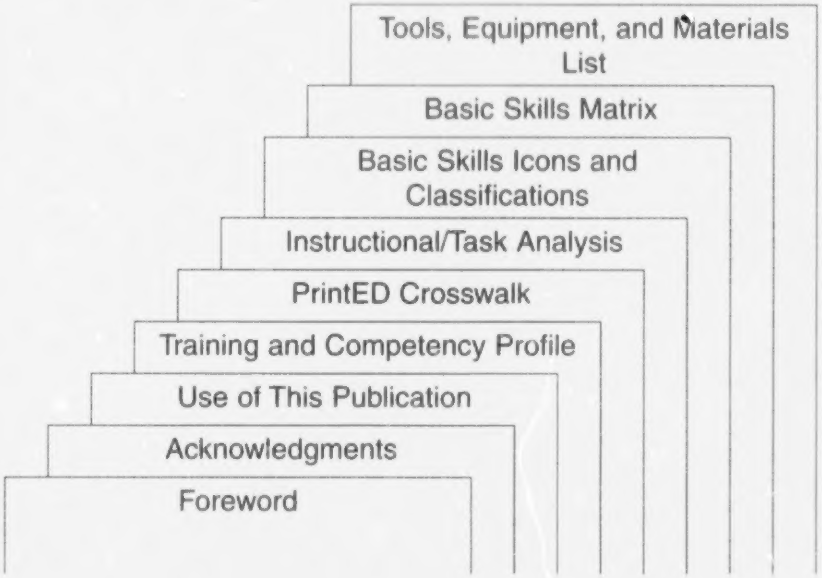
Use of This Publication

For group instruction, the teacher should determine the best way to teach each objective and allow for student participation. For self-paced or individualized instruction, students should be provided with opportunities to become involved in planning and being responsible for their own education. Careful study of each unit of instruction by the teacher will help to determine the following:

- amount of material that can be covered in each class period;
- supplies and materials required for assignment sheets and job sheets;
- resource people who must be contacted;
- supplementary materials to be ordered;
- skills that must be demonstrated and the amount of class time needed for demonstrations; and
- amount of class time needed for student practice and return demonstrations of mastered skills.

Teachers are encouraged to localize and personalize these materials to meet the needs of individual students, the community, and prospective employers.

Introductory Pages


Tools, Equipment, and Materials List
Basic Skills Matrix
Basic Skills Icons and Classifications
Instructional/Task Analysis
PrintED Crosswalk
Training and Competency Profile
Use of This Publication
Acknowledgments
Foreword

Use of This Publication

In addition to general information, such as the table of contents, acknowledgments, and the use of this publication, the following tools have been provided to assist administrators and teachers in planning for instruction.

☐ **Training and Competency Profile.** This form may be copied and used to record information about each student, such as enrollment dates, class attendance, and work experience, and to document the student's mastery of specific job competencies. It can also be used to provide information about the student's qualifications to potential employers and/or for entry into advanced training programs.

☐ **PrintED Crosswalk.** This document identifies the PrintED competencies covered in this publication and lists specifically where these skills are located by unit number and objective.

☐ **Instructional/Task Analysis.** This document provides a quick review of the contents of this publication by identifying the cognitive skills (what the student should know) and psychomotor skills (what the student should be able to do) addressed in each unit of instruction.

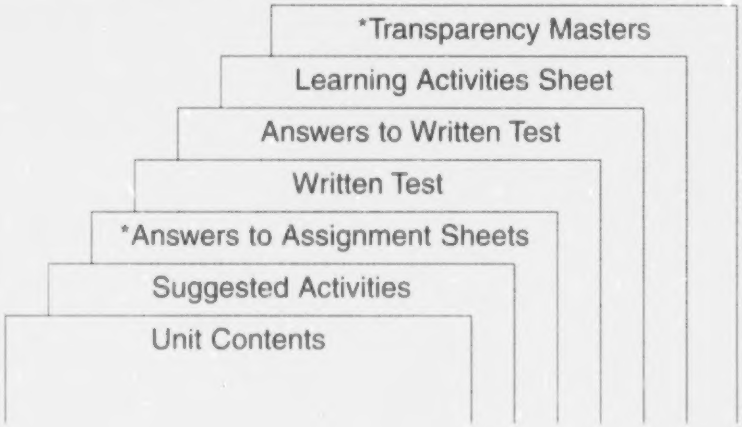
☐ **Basic Skills Icons and Classifications.** This page provides a reference guide of the graphic symbols that are used to identify the basic academic and workplace skills included in each assignment sheet and job sheet.

☐ **Basic Skills Matrix.** This document graphically summarizes the academic and workplace skills training included in the instructional materials. it should be helpful to teachers in planning for instruction, and to administrators as documentation that basic skills are being taught as part of the vocational training.

☐ **Tools, Equipment, and Materials List.** This document provides a comprehensive list of those items needed in a vocational program for students to complete training. It also can assist administrators and teachers in determining program costs.

Use of This Publication

Teacher Pages



*Designates components that may not appear in every unit of instruction

Teachers should study the teacher and student pages before introducing the unit, allowing enough time to obtain supplemental materials and to contact outside resource persons.

☐ **Suggested Activities.** This component assists teachers during the preparation stage of the teaching/learning process by providing an instructional plan, teaching suggestions, a list of references used in the development of each unit, and a list of suggested supplemental resources (books, posters, pamphlets, videotapes, computer software, and Internet sites) that may be used to enhance instruction.

Instructions for evaluating student performance on the assignment sheets and job sheets are also included in the suggested activities section. Teachers should select and discuss with students the rating scale that will be used.

☐ **Answers to Assignment Sheets.** An answer key is provided, when applicable, to assist the teacher in evaluating student performance on a given assignment.

☐ **Written Test.** This component provides criterion-referenced evaluation of every cognitive objective listed in the unit of instruction, and serves as both a pretest and posttest to assist teachers in measuring each student's competency gains. (Assignment sheet and job sheet objectives are not evaluated on the written test.) If the teacher has added, deleted, or modified any objectives, appropriate changes should be made to both the test and answers to the written test.

Tests may be divided into shorter tests covering three or four objectives at a time and given soon after those objectives have been covered. A selection of test items from the units covered may be used for a final test at the end of each term if desired. The written test is included in the teacher edition only and should be duplicated for student use.

☐ **Answers to Written Test.** An answer key is provided to assist the teacher in evaluating student performance on the written test.

☐ **Learning Activities Sheet.** This component provides a model for teachers to use in implementing a self-paced or individualized program, and guides the student through the required components in the student edition (objective sheet, information sheet, student supplements, assignment sheets, and job sheets). The teacher should modify the learning steps as needed to incorporate resources available in the classroom (videotapes, computer software, magazines, etc.) and to address instructional strategies that may be needed to enhance learning for each student. Final copies should be distributed for student use.

The following icons will be used on the learning activities sheet to denote steps that require additional resources:

📖 Read a book, magazine, or journal article

💻 Use a CBT program or other software application

WWW Access a site on the World Wide Web

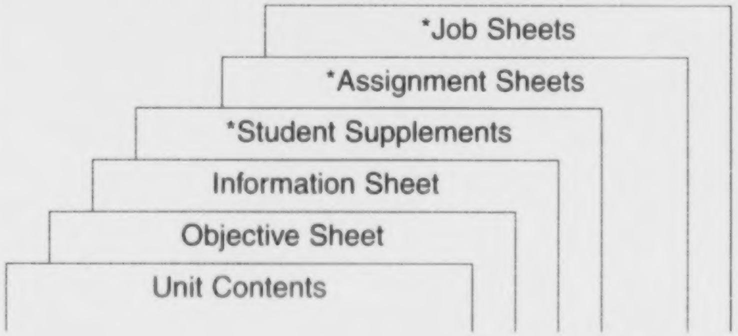
🖥 Look at PowerPoint® or other computer presentation

📼 Watch a videotape

☐ **Transparency Masters.** These overheads are used to direct the students' attention to the topic of classroom discussion. Transparencies allow the student to see as well as hear the information being presented, thus reinforcing the learning process. They may provide illustrations, charts, schematics, or additional information needed to clarify and reinforce objectives included in the unit of instruction. Some of these items may also appear with the appropriate objectives in the information sheet in the student edition. The teacher may make acetate copies from the masters or, in most cases, complete transparency sets are available for purchase.

Use of This Publication

Student Edition



*Designates components that may not appear in every unit of instruction

For best results, students should be provided with a copy of the student edition and should be allowed to take notes in the margins as additional information is provided by the instructor or as the student acquires additional information through library or Internet research.

☐ **Objective Sheet.** This component summarizes each unit for the student and teacher. The objective sheet is based on established performance objectives that state the goals for successful completion of a unit of instruction. Objectives are stated in two forms: unit objectives that state the expected performance of each student after completion of the unit and specific (enabling) objectives that state what the student must be able to do to reach the unit objective.

The objectives should be stressed throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods.

Teachers should modify, delete, or add objectives in order to meet the needs of the students and community. When objectives are added, the teacher should remember to supply the needed information, assignment and/or job sheets, and criterion-referenced test items to cover the new objectives.

☐ **Information Sheet.** This component provides the student with the essential information for meeting the cognitive objectives in the unit. Teachers will find that the information sheet serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective. Students should read the information sheet before the information is discussed in class. Space is provided in the margins for students and teachers to add notes that clarify and/or expand upon the information presented.

☐ **Student Supplements.** This component is included in a unit of instruction when additional information is needed in order for students to complete one or more of the assignment and/or job sheets. Students are not directly tested over the information presented in a supplement; however, their ability to apply this information may be evaluated in the completion of assignment and/or job sheets.

☐ **Assignment Sheets.** The assignment sheets address the learning levels at or above the application level of Bloom's taxonomy. They provide students with an opportunity to use higher-order thinking skills, such as problem solving, synthesizing, analyzing, and evaluating. In addition, they may provide additional opportunities for students to develop their language skills.

Assignment sheets can be paper-and-pencil activities, as well as those using computer software, videotapes, models, handouts, or other resources as appropriate. Criteria are provided to evaluate student performance objectively.

☐ **Job Sheets.** Job sheets are designed as skill tests and give the instructor direction as to the psychomotor skills to be taught, and provide the criteria to evaluate student performance objectively. They also help provide potential employers with a picture of the skills being taught during training and the performances that might be reasonably expected from an individual who has completed the training.

The teacher should provide students with a copy of each job sheet and/or the procedure's manual and/or job specifications when necessary. The teacher should also discuss the equipment and materials that will be needed for the job and the criteria that will be used to evaluate the student's performance, and demonstrate the procedure prior to having students practice the procedure. Safety should be stressed as part of each demonstration.

When a student is ready to be evaluated, the teacher should follow the instructions for evaluating student performance which may be found in the suggested activities component of the teacher unit.

As you use these instructional materials we hope that you will find that they contribute to the quality of your program. If any problems occur or if you have any suggestions for improvement of the materials, please write us at 1500 West Seventh Avenue, Stillwater, OK 74074-4364, or e-mail us at mavccweb@okvotech.org.

Graphic Arts: Orientation, Composition, and Paste-Up

Training and Competency Profile

Student Information

Program ______________________ Instructor ______________________

Name ______________________ Soc. Sec. No. ______________________

Address ______________________ Phone ______________________

Grade ____________ School ______________________

Allergies/Disabilities that might require special accommodation for training (please specify)

____

In case of emergency, contact ______________________ Phone ______________

Record of Enrollment

Date of Enrollment ____ - ____ - ____ Total Class Hours ________ Total Hours Absent ________

Date of Withdrawal ____ - ____ - ____ Total On-the-Job Training Hours ________ Total Hours Tardy ________

Date of Completion ____ - ____ - ____ Total Lab Hours ________

On-the-Job Training/Work Experience

______________________ ______________________
Place of Employment Address

______________________ ______________________
Supervisor's Name Phone

______________________ ______________________
Duration of Employment Job Title

____
Job Responsibilities

______________________ ______________________
Place of Employment Address

______________________ ______________________
Supervisor's Name Phone

______________________ ______________________
Duration of Employment Job Title

____
Job Responsibilities

BEST COPY AVAILABLE

Training and Competency Profile

Student Evaluation

Directions: Evaluate the student using one of the rating scales below. Write the appropriate number to indicate the degree of competency achieved. The descriptions associated with each of the numbers focuses on a level of student performance for each of the tasks listed. The written test scorelines are provided for optional teacher use. They may not be applicable in all cases.

Sample A

4	**Skilled**—Can perform job with no additional training.
3	**Moderately Skilled**—Has performed job during training program; limited additional training may be required.
2	**Limited Skill**—Has performed job during training program; additional training is required to develop skill.
1	**Unskilled**—Is familiar with process, but is unable to perform job.
0	**No Exposure**—No information or practice provided during training program.

Sample B

Yes—Can perform job with no additional training.
No—Is unable to perform job satisfactorily.

Unit 1: Orientation

_______ 1. Research graphic arts careers and present information.
_______ 2. Determine graphic arts employment opportunities.
_______ 3. Interview graphic arts employees.
_______ 4. Visit a printing shop.
_______ 5. Develop a career plan.
_______ 6. ______________________________
_______ 7. ______________________________

Written Test Scores
Pretest Score ________%
Posttest Score ________%

Unit 2: Shop Safety

_______ 1. Complete a student safety pledge form.
_______ 2. Survey the shop and identify correct safety practices.
_______ 3. Interpret a material safety data sheet.
_______ 4. Draw a floor plan and locate safety equipment in your shop.
_______ 5. Operate a fire extinguisher.
_______ 6. Lift a heavy object properly.
_______ 7. ______________________________
_______ 8. ______________________________

Written Test Scores
Pretest Score ________%
Posttest Score ________%

Unit 3: Related Math and Measuring

_______ 1. Add whole numbers.
_______ 2. Subtract whole numbers.
_______ 3. Multiply whole numbers.
_______ 4. Divide whole numbers.
_______ 5. Reduce fractions to lowest terms.
_______ 6. Convert fractions and mixed numbers
_______ 7. Add fractions.
_______ 8. Subtract fractions.
_______ 9. Multiply fractions.
_______ 10. Add decimal numbers.
_______ 11. Subtract decimal numbers.
_______ 12. Multiply decimal numbers.
_______ 13. Divide decimal numbers.
_______ 14. Convert fractions and percentages.
_______ 15. Solve percentage problems.
_______ 16. Read a U.S. customary rule.
_______ 17. ______________________________
_______ 18. ______________________________

Written Test Scores
Pretest Score ________%
Posttest Score ________%

Unit 4: Shop Organization

_______ 1. Make an organizational chart of the school print shop.
_______ 2. Draw a floor plan locating production areas in the school print shop.
_______ 3. Compare job tickets for similarities and differences.
_______ 4. Read and comprehend information on a job ticket.
_______ 5. ______________________________
_______ 6. ______________________________

Written Test Scores
Pretest Score ________%
Posttest Score ________%

Unit 5: Printing Processes

_______ 1. Write a summary of an article on current printing processes.
_______ 2. Identify printing processes used to reproduce different printed pieces.
_______ 3. Describe the offset printing process.
_______ 4. Test the ink-water principle on an offset plate.
_______ 5. ______________________________
_______ 6. ______________________________

Written Test Scores
Pretest Score ________%
Posttest Score ________%

Training and Competency Profile

Unit 6: Paper

_______ 1. Identify basic grades of paper.
_______ 2. Choose the correct paper for various jobs.
_______ 3. Select and order paper utilizing a paper cabinet and paper price book.
_______ 4. _______________________
_______ 5. _______________________

Written Test Scores
Pretest Score _______%
Posttest Score _______%

Unit 7: Typography

_______ 1. Identify typeface classes in printed material.
_______ 2. Measure type.
_______ 3. Identify formats of type composition.
_______ 4. _______________________
_______ 5. _______________________

Written Test Scores
Pretest Score _______%
Posttest Score _______%

Unit 8: Typesetting

_______ 1. Calculate copyfitting.
_______ 2. Mark up copy.
_______ 3. Set type using a phototypesetting machine.
_______ 4. Set type using a computer.
_______ 5. _______________________
_______ 6. _______________________

Written Test Scores
Pretest Score _______%
Posttest Score _______%

Unit 9: Design Principles

_______ 1. Make thumbnail and rough layouts.
_______ 2. Label magazine ads that utilize principles of design.
_______ 3. Identify types of art in printed material.
_______ 4. Complete a drawing of the printer's color wheel.
_______ 5. Identify six basic color combinations in printed material.
_______ 6. _______________________
_______ 7. _______________________

Written Test Scores
Pretest Score _______%
Posttest Score _______%

Unit 10: Paste-Up Principles and Procedures

_______ 1. Prepare a paste-up.
_______ 2. Prepare overlays using clear acetate and ruby film.
_______ 3. Crop a photograph.
_______ 4. Scale copy.
_______ 5. _______________________
_______ 6. _______________________

Written Test Scores
Pretest Score _______%
Posttest Score _______%

Unit 11: Proof Procedures and Legal Considerations

_______ 1. Read and mark proof copy.
_______ 2. _______________________
_______ 3. _______________________

Written Test Scores
Pretest Score _______%
Posttest Score _______%

PrintED Crosswalk

The following PrintED tasks are covered in this publication. The first column identifies the PrintED task by name and number. The second column identifies the exact location by unit number and objective, assignment sheet, or job sheet in this MAVCC publication unless otherwise noted.

For more information about PrintED, contact:

Printing Industries of America, Inc.
100 Daingerfield Road
Alexandria, VA 22314-2888

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
A. Introduction	
1. Define the role of graphics in the free enterprise system.	Unit 1, Student Supplement 1—Dramatic Changes for the Future
2. Identify printing markets & types of printing businesses.	Unit 1, Objective 4—Types of organizations that employ graphic arts employees; Assignment Sheet 1—Research graphic arts careers and present information; Assignment Sheet 2—Determine graphic arts employment opportunities
3. List printing's ranking among other industries.	
4. Identify the major printing processes.	Unit 5, Objective 2—Major printing processes
5. List the advantages of each major process. 6. List the disadvantages of each major process.	Unit 5, Objective 5—Advantages, disadvantages, and uses of the major printing processes
7. Identify the products produced by each major process.	Unit 5, Objective 5—Advantages, disadvantages, and uses of the major printing processes; Assignment Sheet 2—Identify printing processes used to reproduce different printed pieces
8. List in order the business flow of printing from initial need to final product.	Unit 4, Objective 7—Components of a job ticket Unit 5, Objective 3—Principal prepress steps in offset printing

PrintED Crosswalk

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
9. List in order the technical production flow from idea to finished product.	Unit 4, Objective 4—Production steps of a job using traditional printing methods Unit 5, Objective 3—Principal prepress steps in offset printing
10. Identify major occupations in the graphic arts and understand the basic training needed for each. 11. List the major responsibilities for each occupation.	Unit 1, Objective 2—Categories of graphic arts careers; Objective 3—Major areas of specialization in the graphic arts industry; Assignment Sheet 1—Research graphic arts careers and present information; Assignment Sheet 2—Determine graphic arts employment opportunities; Assignment Sheet 3—Interview graphic arts employees Unit 4, Objective 3—Job titles and descriptions of job duties
12. Identify basic salary/wage expectation ranges for local area.	Unit 1, Assignment Sheet 1—Research graphic arts careers and present information; Assignment Sheet 3—Interview graphic arts employees
13. Comprehend basic printing technology.	Unit 5, Objective 4—Basic offset printing process
14. Read and comprehend production information from job jacket/ticket.	Unit 4, Objective 7—Components of a job ticket; Assignment Sheet 3—Compare job tickets for similarities and differences; Assignment Sheet 4—Read and comprehend information on a job ticket
B. Digital Image Preparation	
1. Identify fundamentals of type and its uses.	Unit 7, Objective 3—Classifications of typefaces; Assignment Sheet 1—Identify typeface classes in printed material *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
2. Demonstrate a keyboard typing proficiency of 20 WPM.	19

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
3. Set text with appropriate margins, formatting, gutters, guides, trims and folds.	*Graphic Arts: Electronic Prepress and Publishing*, Unit 3—Software; Unit 5—Document Design
4. Flow copy from word processing program to page layout program according to job specifications.	*Graphic Arts: Electronic Prepress and Publishing*, Unit 3—Software
5. Define the difference between rastor and vector.	*Graphic Arts: Electronic Prepress and Publishing*, Unit 6—Scanning and File Manipulation
6. Define removable media.	*Graphic Arts: Electronic Prepress and Publishing*, Unit 2—Electronic Prepress Systems
7. Import an image in a page layout document.	*Graphic Arts: Electronic Prepress and Publishing*, Unit 5—Document Design; Unit 6—Scanning and File Manipulation; Unit 7—Layout and Document Preparation
C. Reproduction Photography	
1. Identify basic darkroom equipment and hand tools.	*Graphic Arts: Process Camera, Stripping, and Platemaking*—Unit 1, Objective 5—Darkroom equipment/supplies and their uses
2. Identify basic materials and supplies for line photography.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 1, Objective 5—Darkroom equipment/supplies and their uses; Objective 6—Types of camera film
3. Produce a good quality line negative using sensitivity guide/scale.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 1, Objective 13—Job Sheet 1—Prepare a darkroom for tray processing, and expose and develop a line negative
D. Image Assembly/Platemaking	
1. Identify basic image assembly equipment and hand tools. 2. Identify basic image assembly materials and supplies.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 6, Objective 2—Stripping tools and materials
3. Produce a single color flat with correct dimensions.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 6, Job Sheet 2—Strip a ruled flat; Job Sheet 3—Lay out and strip an unruled flat (wrong-reading)

PrintED Crosswalk

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
4. Make necessary corrections to flat (i.e. opaque/scribing).	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 6, Job Sheets 2 through 13
5. Identify platemaking equipment and tools for offset plates.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 7, Objective 4—Plate exposing devices
6. Produce a correctly exposed & processed plate for offset printing.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 7, Job Sheets 1 through 14
7. Identify various proofing systems.	Unit 11, Objective 3—Types of proofs
E. Press Operations	
1. Identify basic offset duplicator parts & operations.	*Graphic Arts: The Press and Finishing Processes*, Unit 1, Objective 3—Basic systems of a typical sheet fed offset press; Objective 4—Functions of the basic systems of a typical sheet fed offset press
2. Identify basic safety and operation procedures for an offset duplicator for single color printing.	*Graphic Arts: The Press and Finishing Processes*, Unit 3, Objective 2—Essential safety precautions
3. Perform basic setup for printing a single color job. 4. Produce a printed single color job using an offset duplicator.	*Graphic Arts: The Press and Finishing Processes*, Unit 3, Job Sheet 3—Operate an offset press from setup of systems through printed sheet delivery
5. Perform daily clean up and maintenance.	*Graphic Arts: The Press and Finishing Processes*, Unit 4, Job Sheet 6—Degrease plate and impression cylinders
F. Finishing and Binding	
1. Identify operational & safety parts of a paper cutter.	*Graphic Arts: The Press and Finishing Processes*, Unit 6, Objective 2—Safety rules for operating a paper cutter
2. Identify grain direction of paper.	Unit 6, Objective 5—Tests and procedures for determining grain direction
3. Calculate basic paper cuts from stock sheet.	*Graphic Arts: The Press and Finishing Processes*, Unit 6, Assignment Sheet 1—Use the formula for cutting paper stock; Assignment Sheet 3—Calculate a combination cut using stock cutting formula

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
4. Draw a master cutting diagram for making cuts.	*Graphic Arts: The Press and Finishing Processes*, Unit 6, Assignment Sheet 1—Use the formula for cutting paper stock; Assignment Sheet 3—Calculate a combination cut using stock cutting formula; Assignment Sheet 4—Draw a cutting diagram
5. Make accurate paper cuts using a mechanized paper cutter.	*Graphic Arts: The Press and Finishing Processes*, Unit 6, Job Sheet 1—Cut carbonless paper
6. Identify basic paper types, weights, grades and classifications used in the printing industry.	Unit 6, Objective 2—Basic paper grades; Objective 3—Basic paper sizes; Assignment Sheet 1—Identify basic grades of paper
7. Identify padding equipment and hand tools. 8. Identify padding materials. 9. Produce correctly made pads of paper.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Job Sheet 1—Pad 20-pound stock; Job Sheet 2—Pad carbonless paper
10. Identify stapling and stitching equipment and hand tools. 11. Identify stapling and stitching materials and supplies.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Objective 2—Binding techniques
12. Produce side and saddle stitched/stapled products.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Job Sheet 5—Hand fold, collate, and staple a booklet
13. Identify punching/drilling equipment and hand tools.	
14. Measure to drill 3 ring notebook pages. 15. Make holes for 3 ring notebook.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Job Sheet 3—Drill paper stock for a 3-ring binder
16. Identify folding equipment and hand tools. 17. Identify basic folds for printed products.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Objective 3—Major folding styles
18. Make a single fold using an automatic folding machine.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Objective 4—Processes associated with finishing activities
19. Identify collating equipment and hand tools.	
20. Make sets of paper using collating equipment in proper sequence.	

PrintED Crosswalk

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
21. Hand collate sets in proper sequence.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Job Sheet 5—Hand fold, collate, and staple a booklet
22. Identify die cut products and the basic procedure for diecutting.	
23. Understand basic equipment materials and procedures for foil stamping and embossing.	
24. Identify soft and hard case binding to include methods and glue applications.	
25. Demonstrate basic paper accounting techniques to include spoon method, thumb method and fanning method.	
26. Demonstrate safe paper carrying methods, including roll method, etc.	
27. Demonstrate basic paper jogging techniques.	*Graphic Arts: The Press and Finishing Processes*, Unit 7, Job Sheet 1—Pad 20-pound stock; Job Sheet 2—Pad carbonless paper
G. Measurement	
1. Measure linear dimensions for printing materials in inches & fractions of inches.	Unit 10, Job Sheet 1—Prepare a paste-up; Job Sheet 2—Prepare overlays using clear acetate and ruby film
2. Measure type in points and picas.	Unit 7, Assignment Sheet 2—Measure type *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
3. Measure volume for mixing chemicals for pressroom operations.	*Graphic Arts: The Press and Finishing Processes*, Unit 2, Job Sheet 1—Mix dampening solution and test for pH
4. Measure copy for reduction and enlargement using various methods to determine percentage setting.	Unit 10, Job Sheet 4—Scale copy *Graphic Arts: Electronic Prepress and Publishing*, Unit 5—Document Design

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
H. Safety & First Aid	
1. Identify location(s) of fire safety equipment.	Unit 2, Assignment Sheet 2—Survey the shop and identify correct safety practices; Assignment Sheet 4—Draw a floor plan and locate safety equipment in your shop
2. Describe proper use of fire safety equipment.	Unit 2, Job Sheet 1—Operate a fire extinguisher
3. List safety rules involving flammable liquids.	Unit 2, Objective 5—Toxic chemical safety rules
4. List the steps to be taken in case of injury in the lab.	Unit 2, Objective 16—General guidelines for first aid emergencies; Objective 17—Bloodborne pathogens and special first aid precautions
5. Identify location(s) of first aid kit(s) and eye wash station(s).	Unit 2, Assignment Sheet 2—Survey the shop and identify correct safety practices; Assignment Sheet 4—Draw a floor plan and locate safety equipment in your shop
6. MSDS—Read and comprehend Material Safety Data Sheets.	Unit 2, Student Supplement 1—Guidelines for interpreting material safety data sheets; Assignment Sheet 3—Interpret a material safety data sheet
7. Identify protective safety equipment where needed (gloves, goggles, ear plugs).	Unit 2, Objective 4—Personal protective equipment which might be required in a print shop
8. Follow proper safety procedures when operating equipment.	Unit 2, Objective 2—Proper safety rules; Objective 3—Maintaining a safe and orderly shop; Assignment Sheet 1—Complete a student safety pledge form
9. Follow approved shop dress code for safe operation including necessary personal safety equipment.	Unit 2, Objective 2—Proper safety rules; Objective 4—Personal protective equipment
10. Pass general lab safety test.	Unit 2, Written Test
11. Use approved methods to dispose of waste materials.	Unit 2, Objective 3—Maintaining a safe and orderly shop

PrintED Crosswalk

	PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
12.	Read, comprehend and follow instructions on warning labels.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 1, Objective 9—Interpret HMIS labels
13.	Demonstrate common sense when working with others.	Unit 2, Objective 2—Proper safety rules to be practiced in the shop
14.	Demonstrate a working knowledge of the safety color code.	Unit 2, Objective 10—Colors of safety color code and their designations
I.	**Basic Math**	
1.	Solve addition of whole number problems— 2 & 3 digits.	Unit 3, Objective 4 and Assignment Sheet 1—Add whole numbers
2.	Solve addition of fraction problems.	Unit 3, Objective 11 and Assignment Sheet 7—Add fractions
3.	Solve addition of decimal problems—2 & 3 digits.	Unit 3, Objective 15 and Assignment Sheet 10—Add decimal numbers
4.	Solve subtraction of whole number problems—2 & 3 digits.	Unit 3, Objective 5 and Assignment Sheet 2—Subtract whole numbers
5.	Solve subtraction of fraction problems.	Unit 3, Objective 12 and Assignment Sheet 8—Subtract fractions
6.	Solve subtraction of decimal problems—2 & 3 digits.	Unit 3, Objective 16 and Assignment Sheet 11—Subtract decimal numbers
7.	Solve multiplication of whole numbers—2 & 3 digits.	Unit 3, Objective 6 and Assignment Sheet 3—Multiply whole numbers
8.	Solve multiplication of fraction problems.	Unit 3, Objective 13 and Assignment Sheet 9—Multiply fractions
9.	Solve multiplication of decimal problems—2 & 3 digits.	Unit 3, Objective 17 and Assignment Sheet 12—Multiply decimal numbers
10.	Solve division of whole number problems—2 & 3 digits.	Unit 3, Objective 7 and Assignment Sheet 4—Divide whole numbers
11.	Solve division of fraction problems.	
12.	Solve division of decimal problems—2 & 3 digits.	Unit 3, Objective 18 and Assignment Sheet 13—Divide decimal numbers

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
13. Solve fraction to decimal conversion problems. 14. Solve decimal to fraction conversion problems. 15. Solve decimals to percent conversion problems. 16. Solve percent to decimals conversion problems.	Unit 3, Objective 19 and Assignment Sheet 14—Convert fractions and percentages
17. Solve basic ratio and proportion problems.	
18. Solve basic linear measurement problems.	Unit 3, Assignment Sheet 16—Read a U.S. customary rule
19. Solve basic type calculation problems.	Unit 8, Objective 5—Copyfitting; Assignment Sheet 1—Calculate copyfitting
20. Solve basic liquid measurement problems.	*Graphic Arts: Process Camera, Stripping, and Platemaking*, Unit 1, Job Sheet 1—Prepare a darkroom for tray processing , and expose and develop a line negative *Graphic Arts: The Press and Finishing Processes*, Unit 2, Job Sheet 1—Mix dampening solution and test for pH
21. Solve basic paper cutting calculations.	*Graphic Arts: The Press and Finishing Processes*, Unit 6, Objective 7—Formula for determining number of sheets to be cut for a printing job; Objective 8—Formulas for making a combination cut; Assignment Sheets 1 through 4
22. Solve basic points and picas measurement problems.	Unit 7, Objective 5—Measurement of type; Assignment Sheet 2—Measure type *Graphic Arts: Electronic Prepress and Publishing*, Unit 4, Type Selection
23. Solve inches to picas conversion problems. 24. Solve picas to inches conversion problems. 25. Solve inches to points conversion problems. 26. Solve points to inches conversion problems.	Unit 7, Objective 5—Measurement of type *Graphic Arts: Electronic Prepress and Publishing*, Unit 4, Type Selection

PrintED Introduction to Graphic Communications Tasks	MAVCC Tasks
27. Solve cost calculating problems.	*Graphic Arts: The Press and Finishing Processes*, Unit 5, Objective 3—Cost items to consider when giving an estimate on a printing job; Objective 4—Cost awareness factors for a successful printing business; Assignment Sheet 1—Estimate costs of printing jobs
J. Job Application and Interpersonal Skills	
1. Demonstrate proper work ethic/habits.	
2. List means of locating job openings. 3. Read and comprehend want ads.	Unit 1, Assignment Sheet 2—Determine graphic arts employment opportunities
4. Write a personal resume.	
5. Write a cover letter for obtaining a printing job.	
6. Read and comprehend an employment application form.	
7. Complete a job employment application form.	
8. Practice job interview skills and appearance.	
9. Complete a telephone interview for a printing job.	
10. Write a follow-up letter.	
11. Make a follow-up telephone call.	
12. Evaluate benefit package for employment.	
13. Compare job opportunities.	Unit 1, Assignment Sheet 1—Research graphic arts careers and present information; Assignment Sheet 2—Determine graphic arts employment opportunities
14. Observe a commercial printing operation.	Unit 1, Assignment Sheet 4—Visit a printing shop

PrintED Digital Image Preparation Tasks	MAVCC Tasks
A. Type	
1. Measure copy/text in points and picas using a line gauge. 2. Measure type using a typesizing gauge.	Unit 7, Assignment Sheet 2—Measure type *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
3. Identify x-height, meanline, baseline, ascenders, descenders, and their roles in measuring and designing with type.	Unit 7, Objective 2—Parts of a type character *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
4. Identify caps, lowercase, uppercase, small caps, and ligatures.	Unit 7, Objective 1—Terms and definitions *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
5. Define dingbats, bullets, rules, and symbols and their uses in publications.	*Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
6. Distinguish between display (headline) type and body (text) type by their point sizes and styles.	Unit 7, Objective 1—Terms and definitions *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
7. Identify the basic type styles and their uses.	*Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
8. Distinguish between serif and sans serif type styles.	Unit 7, Objective 3—Classifications of typefaces; Assignment Sheet 1—Identify typeface classes in printed material *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
9. Explain letterspacing, tracking, and kerning of type characters. 10. Explain wordspacing and the relation of em and en in paragraph spacing. 11. Define linespacing and explain the measurement principles for the leading of text.	Unit 7, Objective 5—Measuring type; Assignment Sheet 2—Measure type *Graphic Arts: Electronic Prepress and Publishing*, Unit 4—Type Selection
12. Define the type arrangements: flush left-ragged right, flush right-ragged left, centered, and justified.	Unit 7, Objective 6—Formats of type composition; Assignment Sheet 3—Identify formats of type composition *Graphic Arts: Electronic Prepress and Publishing*, Unit 3—Software

Graphic Arts: Orientation, Composition, and Paste-Up

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 1: Orientation

1. Terms and definitions
2. Categories of graphic arts careers
3. Major areas of specialization in the graphic arts industry
4. Types of organizations that employ graphic arts employees
5. Personal traits and attitudes important for successful graphic arts careers
6. Related skills important for successful graphic arts employees
7. Personal traits and skills important for graphic arts employees who work with customers
8. Reasons for teamwork
9. Advantages/disadvantages of a career in graphic arts
10. Ten steps to setting and achieving goals
11. Research graphic arts careers and present information
12. Determine graphic arts employment opportunities
13. Interview graphic arts employees
14. Visit a printing shop
15. Develop a career plan

Unit 2: Shop Safety

1. Terms and definitions
2. Proper safety rules to be practiced in the shop
3. Steps in maintaining a safe and orderly shop
4. Personal protective equipment which might be required in a print shop
5. Toxic chemical safety rules
6. Purposes of a material safety data sheet
7. Kinds of safety hazards
8. Things OSHA expects of an employer
9. Things OSHA expects of an employee

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 2: Shop Safety (continued)

Related Information: What the Student Should Know

10. Colors of the safety color code
11. Characteristics of lockout/tagout
12. Components of the fire triangle
13. Classes of fires
14. Types of fire extinguishers and the classes of fire they are designed to extinguish
15. Fire extinguisher symbols
16. General guidelines for first aid emergencies
17. Bloodborne pathogens and special first aid precautions
18. Lifting and carrying items safely

Application: What the Student Should Be Able to Do

19. Complete a student safety pledge form
20. Survey the shop and identify correct safety practices
21. Interpret a material safety data sheet
22. Draw a floor plan and locate safety equipment in your shop
23. Operate a fire extinguisher
24. Lift a heavy object properly

Unit 3: Related Math and Measuring

1. Terms and definitions
2. Symbols used in basic math
3. Place values of a whole number
4. Adding whole numbers
5. Subtracting whole numbers
6. Multiplying whole numbers
7. Dividing whole numbers
8. Types of fractions
9. Reducing fractions to lowest terms
10. Converting fractions and mixed numbers
11. Adding fractions
12. Subtracting fractions
13. Multiplying fractions
14. Placing values for a decimal number
15. Adding decimal numbers
16. Subtracting decimal numbers

Unit 3: Related Math and Measuring (continued)

Related Information: What the Student Should Know

17. Multiplying decimal numbers
18. Dividing decimal numbers
19. Converting fractions and percentages
20. Solving percentage problems

Application: What the Student Should Be Able to Do

21. Add whole numbers
22. Subtract whole numbers
23. Multiply whole numbers
24. Divide whole numbers
25. Reduce fractions to lowest terms
26. Convert fractions and mixed numbers
27. Add fractions
28. Subtract fractions
29. Multiply fractions
30. Add decimal numbers
31. Subtract decimal numbers
32. Multiply decimal numbers
33. Divide decimal numbers
34. Convert fractions and percentages
35. Solve percentage problems
36. Read a U.S. customary rule

Unit 4: Shop Organization

Related Information: What the Student Should Know

1. Major concerns of successful printing plant management
2. Strategies a manager can use to operate a graphic arts business
3. Job titles and their duties
4. Production steps of a job using traditional printing methods
5. Items essential to proper job production control
6. Quality control
7. Components of a job ticket
8. Steps for initiating a printing job

Application: What the Student Should Be Able to Do

9. Make an organizational chart of the school print shop
10. Draw a floor plan locating production areas in the school print shop
11. Compare job tickets for similarities and differences
12. Read and comprehend information on a job ticket

Instructional/Task Analysis

Related Information: What the Student Should Know | **Application: What the Student Should Be Able to Do**

Unit 5: Printing Processes

1. Terms and definitions
2. Major printing processes
3. Principal prepress steps in offset printing
4. Basic offset printing process
5. Advantages, disadvantages, and uses of the major printing processes
6. Specialized printing processes
7. Finishing operations
8. Types of material on which printing is done
9. Methods of feed paper into the press
10. Write a summary of an article on current printing processes
11. Identify printing processes used to reproduce different printed pieces
12. Describe the offset printing process
13. Test the ink-water principle on an offset plate

Unit 6: Paper

1. Terms and definitions
2. Basic paper grades
3. Basic paper sizes
4. Factors affecting paper choice
5. Tests and procedures for determining grain direction
6. Printing process requirements
7. Information to specify when ordering paper
8. Commercial envelope number sizes and their dimensions
9. Rules for handling paper
10. Identify basic grades of paper
11. Choose the correct paper for various jobs
12. Select and order paper utilizing a paper cabinet and paper price book

Unit 7: Typography

1. Terms and definitions
2. Parts of a type character
3. Classifications of typefaces
4. Type families
5. Measurement of type
6. Formats of type composition
7. Identify typeface classes in printed material
8. Measure type
9. Identify formats of type composition

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 8: Typesetting

1. Terms and definitions
2. Composition methods
3. Advantages/disadvantages of composition methods
4. Typesetting process
5. Copyfitting
6. Marking up copy
7. Calculate copyfitting
8. Mark up copy
9. Set type using a phototypesetting machine
10. Set type using a computer

Unit 9: Design Principles

1. Terms and definitions
2. Terms related to color
3. Steps in the design process
4. Things the designer wants from the printer
5. Functions of design
6. Components of printed communication
7. Three stages of layout
8. Principles of design
9. Basic types of art and their sources
10. Working with color
11. Kinds of publication design
12. Make thumbnail and rough layouts
13. Label magazine ads that utilize principles of design
14. Identify types of art in printed material
15. Complete a drawing of the printer's color wheel
16. Identify six basic color combinations in printed material

Unit 10: Paste-Up Principles and Procedures

1. Terms and definitions
2. Paste-up tools and materials
3. Basic paste-up steps
4. Registration methods
5. Use of clear acetate and ruby film
6. Processing art for production
7. Kinds of imposition
8. Postal regulations
9. Prepare a paste-up
10. Prepare overlays using clear acetate and ruby film
11. Crop a photograph
12. Scale copy

Instructional/Task Analysis

Related Information: What the Student Should Know	Application: What the Student Should Be Able to Do
Unit 11: Proof Procedures and Legal Considerations	
1. Terms and definitions	12. Read and mark proof copy
2. Reasons for pulling proofs	
3. Types of proofs	
4. Proofreaders' marks	
5. Reading, marking, and correcting galley proofs	
6. Legal restrictions	
7. Copyright notice	
8. Tests for judging "fair use" of copyrighted material	
9. Items that may be copyrighted	
10. Items not eligible for copyright	
11. Provisions for using photographs of people for advertising purposes	

Basic Skills Icons and Classifications

To assist teachers and students in identifying and documenting where academic and workplace skills are being taught, MAVCC has adopted a system that uses icons and a list of specific tasks to identify the skill or skills that are used in each assignment sheet and job sheet.

A matrix for each of the ten broad skill areas has been included in this edition and reflects key elements from *What Work Requires of Schools: A SCANS Report for America 2000*, a 1991 study by the U.S. Department of Labor; *Workplace Basics: The Skills Employers Want*, a three-year study conducted jointly by the American Society for Training and Development (ASTD) and the United States Department of Labor (DOL); and other national and state sources.

When an activity involving one of these basic skills is identified, the corresponding icon is placed on the assignment sheet and job sheet. Skills training is further defined by classifying specific skills that are required.

Each of the ten broad skill areas—reading, writing, mathematics, science, oral communication, interpersonal or relating, critical thinking, employability, social studies, and technology—is represented by the icon presented below.

Reading Skills

- Reading Comprehension
- Research/Reference
- Functional Reading

Writing Skills

- Language
- Composition
- Research
- Functional Writing

Mathematics Skills

- Operation and Calculation
- Math Application
- Data Analysis and Display
- Functional Math

BEST COPY AVAILABLE

Basic Skills Icons and Classifications

Science Skills

- General Science
- Life Science
- Physical Science
- Earth Science

Oral Communication Skills

- Oral Presentation
- Listening
- Interactive Communication

Interpersonal or Relating Skills

- General Relating
- Teamwork/Cooperation
- Leadership/Influence

Critical Thinking Skills

- Cognitive Activities

Employability Skills

- Job Search/Selections
- Job Acquisition/Development
- Resource Management
- Job Safety

Social Studies Skills

- Information Analysis
- Social Studies Application
- Functional Social Studies

Technology Skills

- Selection
- Application
- Maintenance/Troubleshooting

Unit 1: Orientation

Academic and Workplace Skills

Obj. #	Objective	Icon	Skill	Sub Skill	Description
11	Research graphic arts careers and present information (A.S. 1)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task; comprehend written information for main ideas
				Research/ reference	Locate resources; use magazines and newspapers; use computer
				Functional reading	Follow written instructions
		✎	Writing	Language	State ideas clearly
				Research	Takes notes; use note cards
		🗣	Oral Communication	Oral presentation	Make informative presentations
		💼	Employability	Job search/ selections	Investigate training requirements for a career field/occupation
				Job acquisition/ development	Analyze duties/requirements/benefits of specific job
12	Determine graphic arts employment opportunities (A.S. 2)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Research/ reference	Locate resources; use newspapers
				Functional reading	Follow written instructions
		✎	Writing	Language	State ideas clearly
		💼	Employability	Job search/ selections	Investigate employment prospects of a career field/occupation
				Job acquisition/ development	Locate appropriate jobs
13	Interview graphic arts employees (A.S. 3)	📚	Reading	Functional reading	Follow written instructions
		✎	Writing	Language	State ideas clearly
		🗣	Oral Communication	Listening	Apply active listening skills; draw conclusions/make generalizations

Basic Skills Matrix

Unit 1: Orientation (continued)

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
				Interactive communication	Apply questioning techniques; conduct interviews
			Employability	Job search/ selections	Investigate training requirements for a career field/occupation; investigate benefits of a career field/occupation
14	Visit a printing shop (A.S. 4)		Reading	Functional reading	Follow written instructions
			Writing	Language	State ideas clearly
				Functional writing	Organizes information into appropriate format
			Oral Communication	Listening	Apply active listening skills; draw conclusions
				Interactive communication	Apply questioning techniques
15	Develop a career plan (A.S. 5)		Reading	Functional reading	Follow written instructions; interpret forms
			Writing	Functional writing	Complete forms; organizes information into appropriate format
			Employability	Job search/ selections	Analyze personal occupational aptitudes/preferences
				Job acquisition/ development	Develop personal career path

Unit 2: Shop Safety

Academic and Workplace Skills

Obj. #	Objective	Icon	Skill	Sub Skill	Description
19	Complete a student safety pledge form (A.S. 1)		Reading	Reading comprehension	Comprehend written information for main ideas
			Employability	Job acquisition/ development	Follow established rules, regulations, and policies
20	Survey the shop and identify correct safety practices (A.S. 2)		Reading	Reading comprehension	Analyze and apply what has been read to specific task
			Writing	Language	State ideas clearly
			Oral Communication	Listening	Apply active listening skills
				Interactive communication	Work effectively in a group
			Interpersonal or Relating	General relating	Participate in group activities
			Critical Thinking	Cognitive activities	Collect/record information
21	Interpret a material safety data sheet (A.S. 3)		Reading	Reading comprehension	Comprehend written information for main ideas; analyze and apply what has been read to specific task
				Functional reading	Interpret forms
			Writing	Language	State ideas clearly
			Critical Thinking	Cognitive activities	Collect/record information; transfer knowledge/training to new situations
22	Draw a floor plan and locate safety equipment in your shop (A.S. 4)		Reading	Functional reading	Follow written instructions
			Writing	Functional writing	Organize information into an appropriate format

Unit 2: Shop Safety (continued)

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
23	Operate a fire extinguisher (J.S. 1)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		✋	Employability	Job safety	Demonstrate proper use of safety device
24	Lift a heavy object properly (J.S. 2)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		?	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations

Unit 3: Related Math and Measuring

Academic and Workplace Skills

Obj. #	Objective	Icon	Skill	Sub Skill	Description
21	Add whole numbers (A.S. 1)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with whole numbers; perform basic computations
				Math application	Solve word problems
22	Subtract whole numbers (A.S. 2)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with whole numbers; perform basic computations
				Math application	Solve word problems
23	Multiply whole numbers (A.S. 3)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with whole numbers; perform basic computations
				Math application	Solve word problems
24	Divide whole numbers (A.S. 4)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with whole numbers; perform basic computations
				Math application	Solve word problems
25	Reduce fractions to lowest terms (A.S. 5)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with fractions; perform basic computations
26	Convert fractions and mixed numbers (A.S. 6)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with fractions; perform basic computations

BEST COPY AVAILABLE

Basic Skills Matrix

Unit 3: Related Math and Measuring (continued)

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
27	Add fractions (A.S. 7)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with fractions; perform basic computations
				Math application	Solve word problems
28	Subtract fractions (A.S. 8)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with fractions; perform basic computations
				Math application	Solve word problems
29	Multiply fractions (A.S. 9)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with fractions; perform basic computations
				Math application	Solve word problems
30	Add decimal numbers (A.S. 10)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with decimals; perform basic computations
				Math application	Solve word problems
31	Subtract decimal numbers (A.S. 11)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with decimals; perform basic computations
				Math application	Solve word problems
32	Multiply decimal numbers (A.S. 12)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with decimals; perform basic computations
				Math application	Solve word problems

Unit 3: Related Math and Measuring (continued)

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
33	Divide decimal numbers (A.S. 13)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Calculate with decimals; perform basic computations
				Math application	Solve word problems
34	Convert fractions and percentages (A.S. 14)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Operation and calculation	Convert fractions to decimals; convert fractions to percentages; convert decimals to fractions; convert percentages to fractions
35	Solve percentage problems (A.S. 15)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Math application	Solve word problems; solve percent problems
36	Read a U.S. customary rule (A.S. 16)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		🔢	Mathematics	Math application	Read English measures

Basic Skills Matrix

Unit 4: Shop Organization

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
9	Make an organizational chart of the school print shop (A.S. 1)	📚	Reading	Functional reading	Follow written instructions
		✏	Writing	Functional writing	Organizes information into an appropriate format
10	Draw a floor plan locating production areas in the school print shop (A.S. 2)	📚	Reading	Functional reading	Follow written instructions
		✏	Writing	Functional writing	Organizes information into an appropriate format
		💡	Critical Thinking	Cognitive activities	Define a problem; identify/evaluate alternatives
11	Compare job tickets for similarities and differences (A.S. 3)	📚	Reading	Reading comprehension	Comprehend written information for main ideas
				Functional reading	Follow written instructions
		✏	Writing	Language	Use standard grammar, spelling, and capitalization; state ideas clearly
		💡	Critical Thinking	Cognitive activities	Collect/record information; identify critical elements/issues; see relationship between two or more ideas, objects, or situations
12	Read and comprehend information on a job ticket (A.S. 4)	📚	Reading	Reading comprehension	Comprehend written information for main ideas
				Functional reading	Follow written instructions
		✏	Writing	Language	State ideas clearly

44

Unit 5: Printing Processes

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
10	Summarize an article on current printing processes (A.S. 1)	📚	Reading	Reading comprehension	Gain factual information; comprehend written information for main ideas
				Research/ reference	Select useful resources; find materials in library; use computer; use magazines and newspapers
				Functional reading	Follow written instructions
		✏	Writing	Language	Use standard grammar, spelling, and capitalization; state ideas clearly
				Composition	Use complete sentences; compose reports
		💡	Critical Thinking	Cognitive activities	Analyze/synthesize information
11	Identify printing processes used to reproduce different printed pieces (A.S. 2)	📚	Reading	Functional reading	Follow written instructions
		✏	Writing	Language	State ideas clearly
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
12	Describe the offset printing process (A.S. 3)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		✏	Writing	Language	State ideas clearly
13	Test the ink-water principle on an offset plate (A.S. 4)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
		✏	Writing	Language	State ideas clearly
		⚗	Science	Physical science	Investigate chemical properties
		💡	Critical Thinking	Cognitive activities	Collect/record information; draw conclusions; predict results/outcomes

Basic Skills Matrix

Unit 6: Paper

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
10	Identify basic grades of paper (A.S. 1)	📚	Reading	Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Draw conclusions
11	Choose the correct paper for various jobs (A.S. 2)	📚	Reading	Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Draw conclusions; evaluate alternatives; select an alternative
12	Select and order paper utilizing a paper cabinet and paper price book (A.S. 3)	📚	Reading	Reading comprehension	Analzye and apply what has been read to specific task
				Functional reading	Follow written instructions
		✏	Writing	Functional writing	Complete forms
		🔢	Mathematics	Operation and calculation	Perform basic computations
				Functional math	Determine sales tax; apply computation skills as they are actually used on the job; use calculator for computation
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations

Basic Skills Matrix

Unit 7: Typography

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
7	Identify typeface classes in printed material (A.S. 1)	📚	Reading	Functional reading	Follow written instructions
		?	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
8	Measure type (A.S. 2)	📚	Reading	Functional reading	Follow written instructions
		🔢	Mathematics	Functional math	Make measurements
9	Identify formats of type composition (A.S. 3)	📚	Reading	Functional reading	Follow written instructions
		?	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations

Basic Skills Matrix

Unit 8: Typesetting

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
7	Calculate copyfitting (A.S. 1)	●	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		●	Mathematics	Functional math	Apply computation skills as they are actually used on the job; calculate measurements taken from measuring devices
8	Mark up copy (A.S. 2)	●	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		●	Mathematics	Functional math	Apply computation skills as they are actually used on the job; calculate measurements taken from measuring devices
9	Set type using a phototypesetting machine (J.S. 1)	●	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions; proofs copy
		●	Mathematics	Functional math	Apply computation skills as they are actually used on the job; calculate measurements taken from measuring devices
		?	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
		●	Employability	Resource management	Perform routine tasks related to equipment operation and/or maintenance
		●	Technology	Selection	Choose procedures, tools, or equipment that will produce the desired results
10	Set type using a computer (J.S. 2)	●	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions; proofs copy
		●	Mathematics	Functional math	Apply computation skills as they are actually used on the job; calculate measurements taken from measuring devices
		?	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations

Unit 8: Typesetting (continued)

Academic and Workplace Skills

Obj. #	Objective	Icon	Skill	Sub Skill	Description
			Employability	Resource management	Perform routine tasks related to equipment operation and/or maintenance
			Technology	Selection	Choose procedures, tools, or equipment including computers and related technologies that will produce the desired results

Basic Skills Matrix

Unit 9: Design Principles

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
12	Make thumbnail and rough layouts (A.S. 1)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Identify/develop alternatives
13	Label magazine ads that utilize principles of design (A.S. 2)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
14	Identify types of art in printed material (A.S. 3)	📚	Reading	Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
15	Complete a drawing of the printer's color wheel (A.S. 4)	📚	Reading	Functional reading	Follow written instructions
16	Identify six basic color combinations in printed material (A.S. 5)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations

Unit 10: Paste-Up Principles and Procedures

Academic and Workplace Skills

Obj. #	Objective	Icon	Skill	Sub Skill	Description
9	Prepare a paste-up (J.S. 1)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
10	Prepare overlays using clear acetate and ruby film (J.S. 2)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
11	Crop a photograph (J.S. 3)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations
12	Scale copy (J.S. 4)	📚	Reading	Reading comprehension	Analyze and apply what has been read to specific task
				Functional reading	Follow written instructions
		🔢	Mathematics	Functional math	Apply computation skills as they are actually used on the job; calculate measurements taken from measuring devices; use measuring device to construct lines
		💡	Critical Thinking	Cognitive activities	Transfer knowledge/training to new situations

BEST COPY AVAILABLE

Basic Skills Matrix

Unit 11: Proof Procedures and Legal Considerations

Academic and Workplace Skills					
Obj. #	**Objective**	**Icon**	**Skill**	**Sub Skill**	**Description**
12	Read and mark proof copy (A.S. 1)	📚	Reading	Functional reading	Follow written instructions, proofs copy
		✏	Writing	Composition	Construct symbols

Tools, Equipment, and Materials List

Black ink
Black paper
Burnishing roller
China marking pencil
Clean-up solvents
Clear acetate film and Ruby lith
Computer
Cotton pads (2)
Developed offset plate
Drawing board or light table
Eraser
Fine-tipped black pen
Grid or base sheets
Laser printer
Line gauge
Masking tape
Mechanical films
Nonreproducing light blue pencil or pen
Opaque white paint or correction fluid
Phototypesetting machine
Plain white or coated paper
Preservatives
Processor and chemicals
Proportional scale
Rubber cement
Ruler (metal)
Tissue or tracing paper
Triangle
Trimboard
T-square
Type image carrier
Water bottle
Waxer
Work table
X-Acto knife

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 1–3

Written Test 1–7

Answers to Written Test 1–13

Learning Activities Sheet 1–15

Student Components

Student Page

Objective Sheet 1–3

Information Sheet 1–5

Student Supplement

1—Dramatic Changes for the Future 1–13

Assignment Sheets

1—Research Graphic Arts Careers and Present Information 1–17
2—Determine Graphic Arts Employment Opportunities 1–19
3—Interview Graphic Arts Employees 1–21
4—Visit a Printing Shop 1–23
5—Develop a Career Plan 1–25

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

Teaching Suggestions

- Invite a guest speaker from the graphic arts industry to talk about opportunities, pay, advantages, and disadvantages.
- Obtain want ads from local newspapers and discuss graphic arts employment opportunities in your area.
- Prepare a bulletin board on graphic arts employment opportunities.
- Take a field trip to a commercial printing shop or the production facility of a newspaper or magazine. (Assignment Sheet 4)
- Discuss some of the rapid changes that are taking place in graphic arts technology and future directions this technology will take. (Student Supplement 1)

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Baird, Russell N. *The Graphics of Communication*. Orlando, FL: Harcourt Brace College Publishers, 1993.
- Dennis, Ervin A., and John D. Jenkins. *Comprehensive Graphic Arts*, 3d ed. Peoria, IL: Glencoe/McGraw-Hill, 1999.
- *Executive Summary: Bridging to a Digital Future—A Vision of Dramatic Change*. Alexandria, VA: Printing Industries of America, Inc., 1996.

- *Overview of Graphic Communications*. Pittsburgh, PA: Graphic Arts Technical Foundation.
- Prust, Z.A. *Graphic Communications The Printed Image*. Tinley Park, IL: The Goodheart-Willcox Company, Inc., 1999.
- Romano, Frank J., and Richard M. Romano. *The GATF Encyclopedia of Graphic Communications*. Sewickley, PA: GATF Press, 1998.

Suggested Supplemental Resources

Print Media

- Flecker, Sally Ann, and Pamela J. Groff. *Careers in Graphic Communications: A Resource Book*. Sewickley, PA: GATFPress, 1998.—This resource book serves as an overview of the industry and describes job opportunities available in the graphic arts field. Item No. 1546

  Available from:

  Graphic Arts Technical Foundation
  200 Deer Run Road
  Sewickley, PA 15143-2600
  Toll-free: 1-800-662-3916
  www.gatf.org

Electronic Media

- Video
  - *The Professional Guide to Graphic Design and Commercial Printing*, 2nd ed. King Video Productions, Inc.—Video documentary exploring the step-by-step process of the printing operation from design to the printed piece. Item No. 4711

    Available from:

    Graphic Arts Technical Foundation
    200 Deer Run Road
    Sewickley, PA 15143-2600
    Toll-free: 1-800-662-3916
    www.gatf.org
- Internet Resource
  - Graphic Comm Central—http://teched.vt.edu/gcc/
    This outstanding website contains information about all aspects of the printing and publishing industry. You will find links to the following graphic arts related information: equipment and supply manufacturers; books; curriculum/tutorials; course outlines; and slide presentations. This website also contains 38 digital movies of printing employees talking about their jobs.

Written Test

Name ______________________________

Date ______________________ Score __________

Objective 1

Match the terms with their definitions.

1. Apprenticeship
2. Career
3. Craft-centered
4. Electronic information transfer
5. Goal setting
6. Lifelong learning
7. Manager
8. Outsourcing
9. Robotics

_____ a. Person in charge of managing an enterprise or business

_____ b. Refers to work done by artisans or others with manual skills

_____ c. Process of outlining the steps to be taken to achieve a specific outcome

_____ d. Profession or occupation a person takes in life

_____ e. Subcontracting with an outside company to provide a specific service needed to complete a product

_____ f. Upgrading and updating one's job skills and knowledge to keep pace with technological changes in a field

_____ g. Sending digital information instantly via telephone lines and satellites

_____ h. Use of machines to do repetitive tasks, especially in manufacturing

_____ i. Method of job training in which an employee in a union shop receives classroom training and on-the-job experience as a means of becoming an experienced journeyman

Written Test

Objective 2

Match the categories of graphic arts careers with their descriptions.

1. Creative personnel
2. Engineers and scientists
3. Entrepreneurs
4. Management personnel
5. Skilled technical personnel
6. Support personnel

_____ a. Skilled in writing, art, and design

_____ b. Start their own business in one of the many areas available in the graphic arts field

_____ c. Operate sophisticated machinery and carry out tasks that directly involve machines, materials, and products

_____ d. Supervise the work of others and enjoy working with people

_____ e. Apply science and mathematics principles to research, design, and construct complex products

_____ f. Link between products and customers

Objective 3

Select major areas of specialization in the graphic arts industry by placing an "X" in the appropriate blanks.

_____ a. Bindery

_____ b. Graphic arts photography

_____ c. Press operation

_____ d. Welding

_____ e. Proofreading

_____ f. Electronic prepress

_____ g. Management

Objective 4

Name six types of organizations that employ graphic arts employees.

a. ____

b. ____

c. ____

d. ____

e. ____

f. ____

Objective 5

List eight personal traits and attitudes important for successful graphic arts careers.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________

Objective 6

Select related skills important for successful graphic arts employees by placing an "X" in the appropriate blanks.

_____ a. Accuracy

_____ b. Ability to work without direct supervision

_____ c. Ability to type

_____ d. Desire for perfection

_____ e. Unwillingness to work shifts, weekends, or overtime

Objective 7

Select personal traits and skills important for graphic arts employees who work with customers by placing an "X" in the appropriate blanks.

_____ a. Inability to understand operation of the firm

_____ b. Ability to make clear, logical decisions

_____ c. Good interpersonal skills, particularly on the phone

_____ d. Vague knowledge of job schedules and job progress

_____ e. Act maturely and fairly

_____ f. Negative attitude

_____ g. Makes decisions based on opinions rather than facts

BEST COPY AVAILABLE

Written Test

Objective 8

Explain four reasons for teamwork.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

Objective 9

Distinguish between the advantages and disadvantages of a career in graphic arts by placing an "A" next to advantages and a "D" next to disadvantages.

_____ a. Variety of challenging tasks

_____ b. Close work confinement

_____ c. Open job market

_____ d. Pressure of work deadlines

_____ e. Sense of pride and satisfaction

_____ f. Rigid standards for accuracy

_____ g. Long hours during peak production periods

_____ h. Most good employment opportunities are confined to metropolitan areas

Objective 10

Complete the following statements concerning the ten steps to setting and achieving goals by placing the words below in the correct blanks.

Benefit
Chronological
Deadline
Knowledge
Measurable
People
Prevent
Reward
Sacrifices
Weaknesses

a. Goals are specific, ____________________ , and time bound.

b. List all the ways achieving this goal will ____________________ you personally.

c. Identify your specific strengths, ____________________ , and opportunities as they relate to achieving this goal.

d. List everything that could possibly ____________________ you from achieving this goal.

e. Identify everything, including time, money, and ____________________ that you can anticipate.

f. Identify what additional ____________________ you need to acquire or have access to.

g. List the ____________________, groups, and organizations you may need help from as well as the specific role each one plays.

h. List in _________________ order each activity and their corresponding target dates for completion.

i. Set a ____________________ for achieving this goal.

j. Identify your ____________________ for the achievement of this goal.

***Permission to duplicate this test is granted.**

Answers to Written Test

Objective 1

a.	7	d.	2	g.	4
b.	3	e.	8	h.	9
c.	5	f.	6	i.	1

Objective 2

a.	1	d.	4
b.	3	e.	2
c.	5	f.	6

Objective 3

a, b, c, e, f, g

Objective 4

Any six of the following:

a. Commercial printing plants
b. In-house printing plants
c. Newspapers
d. Magazine publishers
e. Book publishers
f. Yearbook publishers
g. Greeting card publishers
h. Business form printers
i. Financial and legal printers
j. Specialty shops
k. Packaging manufacturers
l. Advertising agencies and public relations firms
m. Printing supply firms
n. Printing machinery companies
o. Paper merchants
p. Federal and state agencies
q. Universities and colleges

Objective 5

Any eight of the following:

a. Adaptability
b. Cooperation
c. Courtesy
d. Dependability
e. Enthusiasm
f. Honesty
g. Initiative
h. Loyalty
i. Patience
j. Self-control
k. Tact

Objective 6

a, b, d

Answers to Written Test

Objective 7	b, c, e
Objective 8	Any four of the following: a. Provides for the work to be done more quickly b. Provides for the work to be equally shared c. Provides for heavy loads to be handled more easily d. Provides for a degree of comradeship rather than isolation e. Provides for difficult jobs to be done more easily
Objective 9	a. A b. D c. A d. D e. A f. D g. D h. D
Objective 10	a. Measurable b. Benefit c. Weaknesses d. Prevent e. Sacrifices f. Knowledge g. People h. Chronological i. Deadline j. Reward

Prerequisites:
None

Learning Activities Sheet

Student Name ____

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

☐ 3. **Study** Information Sheet, Objectives 1 through 10, and Student Supplement 1.

☐ 4. **Do** Assignment Sheet 1, "Research Graphic Arts Careers and Present Information."

☐ 5. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 6. If the evaluation is not satisfactory, repeat step 4.

☐ 6. **Do** Assignment Sheet 2, "Determine Graphic Arts Employment Opportunities."

☐ 7. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 8. If the evaluation is not satisfactory, repeat step 6.

☐ 8. **Do** Assignment Sheet 3, "Interview Graphic Arts Employees."

☐ 9. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 10. If the evaluation is not satisfactory, repeat step 8.

☐ 10. **Research** Online resources regarding graphic arts industry. Visit Graphic Comm Central at http://teched.vt.edu/gcc/ as one of your sources. This website contains several virtual tours of print shops.

☐ 11. **Do** Assignment Sheet 4, "Visit a Printing Shop."

Learning Activities Sheet

☐ 12. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 13. If the evaluation is not satisfactory, repeat step 11.

☐ 13. **Do** Assignment Sheet 5, "Develop a Career Plan."

☐ 14. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 15. If the evaluation is not satisfactory, repeat step 13.

☐ 15. **Check** With instructor for any additional assignments to be completed.

☐ 16. **Do** Additional assignments listed below.

____

____

____

☐ 17. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 18. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

***Permission to duplicate this form is granted.**

Unit 2 Shop Safety

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 2-3

Answers to Assignment Sheets 2-9

Written Test 2-11

Answers to Written Test 2-21

Learning Activities Sheet 2-23

Transparency Masters

1—Components of the Fire Triangle 2-27
2—Classes of Fires and Their Fire Extinguisher Symbols 2-29
3—Types of Fire Extinguishers 2-31

Student Components

Student Page

Objective Sheet 2-3

Information Sheet 2-5

Student Supplement

1—Guidelines for Interpreting Material Safety Data Sheets 2-17

Assignment Sheets

1—Complete a Student Safety Pledge Form 2-21
2—Survey the Shop and Identify Correct Safety Practices 2-23
3—Interpret a Material Safety Data Sheet 2-27
4—Draw a Floor Plan and Locate Safety Equipment in Your Shop 2-31

Job Sheets

1—Operate a Fire Extinguisher 2-33
2—Lift a Heavy Object Properly 2-35

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

- Discuss and demonstrate the job sheets. Make sure all required tools, equipment, and materials are available. Review with students the criteria for evaluation of these activities and the rating scale that will be used to indicate job performance.

Teaching Suggestions

- Stress laboratory safety in all areas of activity.
- Lead students on a tour of the shop and point out mechanical, fire, chemical, light, and noise hazards.
- Invite a representative from the fire department or OSHA to speak on shop safety. Obtain and post OSHA poster #2203 in the classroom.
- Have students make safety posters for use in the shop area.
- Make a safety checklist for students to use in the shop area.
- Discuss local, state, and federal safety regulations and Right-To-Know laws.
- Relate your personal experiences concerning dangerous situations caused by lack of safety.
- Show examples of actual material safety data sheets for hazardous materials used in the shop. Let students know where these MSDSs will be kept in the shop. They should be readily accessible to all students. Discuss Student Supplement 1.
- Obtain and show safety videotapes. See "Suggested Supplemental Resources" for ordering information.
- Discuss color coding as it relates to the shop area.
- Show types of fire extinguishers and their functions.
- Invite a member of your local fire department to demonstrate the proper use of several types of fire extinguishers. Have the department help establish a safe area where the students can learn to put out fires for Job Sheet 1 in this unit.
- Discuss emergency procedures that have been adopted by your school.
- Invite a Red Cross instructor, EMT, or rescue team member to discuss and demonstrate proper first aid procedures. Have the students practice these procedures.
- Demonstrate proper lifting techniques, following the steps listed in the information sheet.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.

- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.

- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.

- Evaluate the job sheets. When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

  Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily completed the process step(s) for each checkpoint area. If the student is unable to complete the procedure correctly, have the student review the materials and try again.

  Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria that are provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

  Two sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) that best fits your program needs.

  Sample A

  4—**Skilled**—Can perform job with no additional training.
  3—**Moderately skilled**—Has performed job during training program; limited additional training may be required.
  2—**Limited skill**—Has performed job during training program; additional training is required to develop skill.
  1—**Unskilled**—Is familiar with process, but is unable to perform job.
  0—**No exposure**—No information or practice provided during training program.

  Sample B

  Yes—Can perform job with no additional training.
  No—Is unable to perform job satisfactorily.

- Give and evaluate the posttest.

Suggested Activities

- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Dennis, Ervin A. *Lithographic Technology in Transition*. Albany, NY: Delmar Publishers, 1997.
- Dennis, Ervin A., and John D. Jenkins. *Comprehensive Graphic Arts*, 3d ed. Peoria, IL: Glencoe/McGraw-Hill, 1999.
- Destree, Thomas M. *The Lithographers Manual*, 9th ed. Sewickley, PA: Graphic Arts Technical Foundation, 1994.
- Prust, Z.A. *Graphic Communications The Printed Image*. Tinley Park, IL: The Goodheart-Willcox Company, Inc., 1999.
- Romano, Frank J., and Richard M. Romano. *The GATF Encyclopedia of Graphic Communications*. Sewickley, PA: GATF Press, 1998.

Suggested Supplemental Resources

Print Media

- *Hazard Communication Model: A Model Program for Printing Plants*. Compiled by PIA. Reference guide outlining the necessary information to help a printing company comply with the OSHA Hazard Communication Standard. Item No. 00ES25247

  Available from:

  Graphic Arts Technical Foundation
  200 Deer Run Road
  Sewickley, PA 15143-2600
  Sales: 1-800-662-3916
  www.gatf.org

Electronic Media

- Internet Resources
  - The National Safety Council—http://www.nsc.org
    This website contains information on safety, health, and the environment.
  - Occupational Safety & Health Administration—http://www.osha.gov
    OSHA's website contains up-to-date safety regulations and standards, directives, fact sheets, etc.

- CD-ROMS/Videos

The following CD-ROMs are also available as videos. The CDs allow students to take a test with full tracking of how many questions were answered correctly or incorrectly.

— *Employee Safety Orientation*—Required by OSHA for training all employees who are exposed to "general hazards." Includes basic requirements, electrical, mechanical, back injury prevention, fire prevention, fire protection, personal protective equipment, and more. No. 913007

— *Hazard Communications–Your Right to Know*—Program includes chemical spills and reinforces the information required for training employees in MSDS and basic hazard communications. No. 990007

— *OSHA's Hazardous Energy Source (Lockout/Tagout)*—This is a training tool for "affected" and "authorized" employees in lockout/tagout procedures. No. 970007

— *Fire Extinguisher Training and Use 2000*—This program explains the various classes of fires, different types of fire extinguishers, the key word PASS, and other tips for emergency use of fire extinguishers. No. 950007

— *Bloodborne Pathogens in the Workplace*—Designed as an information/training video for employees who normally are not exposed to blood or body fluids, but an important part of providing precautionary information to employees. No. 920007

— *Back Injury Prevention*—The variety of lifting tasks in the manufacturing industry require specific techniques under difficult conditions and hazards resulting from incorrect methods. No. 910007

Note: The item numbers listed above only pertain to the CD-ROMS. Visit our website at www.mavcc.org for video ordering information.

To order the CD-ROMs or videos listed above, contact:

MAVCC
1500 West Seventh Avenue
Stillwater, OK 74074
Sales: 1-800-654-3988
www.mavcc.org
E-mail: mavccweb@okvotech.org

Answers to Assignment Sheets

Assignment Sheet 1

Complete a Student Safety Pledge Form

The student should complete the safety pledge form.

Assignment Sheet 2

Survey the Shop and Identify Correct Safety Practices

The student should work in groups of two to three students to answer all questions as they pertain to safety equipment and procedures in the school shop.

Assignment Sheet 3

Interpret a Material Safety Data Sheet

1. Miracle "V-2020" Concentrate
2. Ethylene glycol, alkaline phosphates and silicates
3. Eye and skin irritation
4. Heavier
5. 215-220°F
6. Class IIIB
7. Flush with water for 15 minutes. Contact physician.
8. Yes
9. Protective gloves, eye protection
10. Keep containers closed when not in use.

Assignment Sheet 4

Draw a Floor Plan and Locate Safety Equipment in Your Shop

The student floor plan should accurately represent the school shop with all nine of the locations correctly located and properly identified. Labels should be checked carefully to test the student's ability to follow instructions. Neatness should also be considered.

Written Test

Name ______________________________

Date ____________________ Score __________

Objective 1

Match the terms with their definitions.

1. Accident
2. Combustibles
3. First aid
4. Hazard
5. Material safety data sheet (MSDS)
6. Occupational Safety and Health Administration (OSHA)
7. Right-To-Know
8. Safety

_____ a. A potential source of danger

_____ b. Materials or liquids that catch fire easily

_____ c. Statutory right of access to every public record of a state or federal agency

_____ d. Written or printed material concerning a hazardous chemical

_____ e. State or condition of being safe; freedom from danger, risk, or injury

_____ f. Any suddenly occurring, unintentional event which causes personal injury or property damage

_____ g. Federal agency established to ensure safe and sanitary working conditions for employees

_____ h. Immediate, temporary care given the victim of an accident or sudden illness until the services of a physician can be obtained

Objective 2

Select true statements concerning the proper safety rules to be practiced in the shop by placing an "X" next to the true statements.

_____ a. You may keep equipment running when you leave if you are only going to be gone for a short time.

_____ b. Remove ties, scarves, loose clothing, and jewelry before operating a press or any power equipment.

_____ c. Use the correct tools and equipment when doing a job.

_____ d. Do not stop a machine before reaching in near the moving parts because stopping it will waste time.

_____ e. Earplugs are never needed.

_____ f. Horseplay is permitted in the classroom but not in the shop.

_____ g. Do not sit or lean on light tables.

_____ h. It is all right to use unfamiliar equipment.

_____ i. Conduct yourself in a manner conducive to safe shop practices.

Objective 3

Complete the following statements concerning maintaining a safe and orderly shop by placing the words below in the correct blanks.

Cleanup
Combustible
Floors
Housekeeping
Machinery
Materials
Tools
Unsafe

a. Report any ____________ condition in the shop immediately.

b. Arrange all ______________________ and equipment to permit safe and efficient operation.

c. Keep ____________________ and supplies safely stacked and stored.

d. Keep all ________________ and accessories in cabinets or tool racks.

e. Dispose of all or store all ____________ materials in safe containers.

f. Keep all ____________________ clean and free of debris at all times.

g. Check that adequate ______________________ equipment and cleaning materials are on hand to ensure that maximum cleaning efficiency can be maintained.

h. Participate in daily ______________________ periods.

Objective 4

List five examples of personal protective equipment which might be required in a print shop.

a. ____

b. ____

c. ____

d. ____

e. ____

75

Objective 5

Select true statements concerning toxic chemical safety rules by placing an "X" next to the true statements.

_____ a. Work in a well-ventilated area.

_____ b. Wear protective gloves and aprons when handling chemicals.

_____ c. Safety goggles are not needed.

_____ d. Use unlabeled products only if you know what is in the container.

_____ e. Store chemicals on the highest shelves.

Objective 6

Complete statements concerning purposes of a material safety data sheet (MSDS). Write the correct number on the blank provided before each item.

_____ a. To inform _______________ of the material's physical properties or fast-acting health effects that make it dangerous to handle

1) OSHA
2) the management
3) the user
4) the health department

_____ b. To tell the user the level of _______________ needed

1) protective gear
2) medical care
3) hygiene
4) management

_____ c. To tell the user the _______________ necessary if exposed to the product or its hazards

1) preplanning
2) OSHA regulations
3) legal actions
4) first aid treatment

_____ d. To tell the management and the user the _______________ needed for safely handling spills, fires, and day-to-day operations

1) legal actions
2) preplanning
3) equipment and materials
4) personnel resources

Written Test

_____ e. To tell the user how to ____________________ accidents.

1) report
2) respond to
3) prevent
4) record

Objective 7

List the five kinds of safety hazards.

a. ____

b. ____

c. ____

d. ____

e. ____

Objective 8

Select true statements concerning things OSHA expects of an employer by placing an "X" next to the true statements.

_____ a. Provide a hazard-free workplace and comply with occupational safety and health standards.

_____ b. Use properly color-coded signs to warn of danger.

_____ c. Report within two weeks to OSHA any accident which is fatal or hospitalizes five or more workers.

_____ d. Obtain a material safety data sheet for each hazardous chemical present in the workplace and make sure the MSDSs are readily accessible to employees.

Objective 9

Select true statements concerning things OSHA expects of an employee by placing an "X" next to the true statements.

_____ a. Read the OSHA poster #2203 and comply with its standards.

_____ b. Ignore employer safety and health rules.

_____ c. Report to OSHA any hazardous working situations which you feel the employer has not attended to properly.

_____ d. Only report serious job-related injuries to a supervisor.

Objective 10

Match the colors of the safety color code with their designations.

1. Green
2. Ivory
3. Orange
4. Red
5. Yellow

_____ a. Designates location of the firefighting equipment

_____ b. Highlights an area that might otherwise not be noticed

_____ c. Designates caution and marks physical hazards

_____ d. Designates location of safety and first aid equipment

_____ e. Designates dangerous parts of equipment which may cut, crush, shock, or otherwise injure

Objective 11

Select true statements concerning the characteristics of lockout/tagout by placing an "X" next to the true statements.

_____ a. The purpose of lockout/tagout is to prevent people from being injured while repairing, maintaining, inspecting, and adjusting equipment by controlling all energy sources used, stored, or produced by the equipment.

_____ b. Lockout/Tagout is a standard established by the EPA.

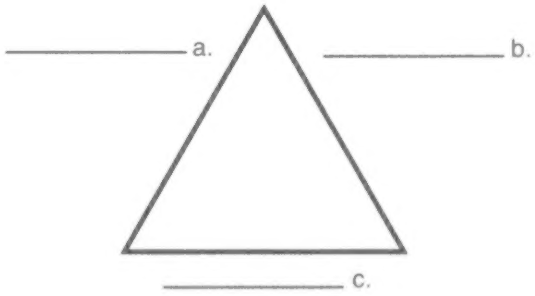
_____ c. Tagging out equipment is the only sure way to prevent serious or fatal injuries that could result from unexpected energizing or start-up of the machine.

_____ d. Lockout devices utilize a key or combination-type lock to hold an energy-isolating device.

_____ e. Tagout devices are prominent warnings, such as a tag securely attached to an energy-isolating device.

Objective 12

Label the three components of the fire triangle on the following illustration.



BEST COPY AVAILABLE

Written Test

Objective 13

Match the classes of fires with their descriptions.

1. Class A
2. Class B
3. Class C
4. Class D

_____ a. Fires that involve electrical or electronic equipment

_____ b. Fires that involve flammable liquids

_____ c. Fires that involve combustible metals

_____ d. Fires that involve ordinary combustible materials

Objective 14

Match the types of fire extinguishers with their uses.

1. Carbon dioxide
2. Dry chemical
3. Foam
4. Halon
5. Pressurized water

_____ a. Direct stream at base of fire; use for class A fires only.

_____ b. Stand back several feet, hold container upright and direct at the base of fire, sweeping from side to side; use for class B or class C fires.

_____ c. Direct discharge as close to fire as possible, first at the edge of flames, then gradually forward and upward; use for class B or class C fires.

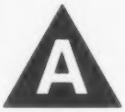
_____ d. Spray above fire, allowing to fall lightly on the fire; use for class A or class B fires.

_____ e. Direct at the base of the flames, then follow up by directing at remaining materials that are burning; use for all classes of fires.

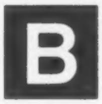
Written Test

Objective 15

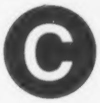
Match fire extinguisher symbols with their meanings. Answers may be used more than once.



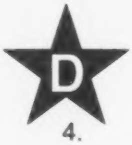
1.



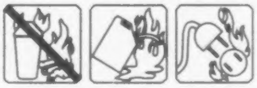
2.



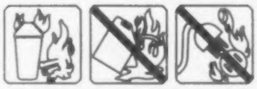
3.



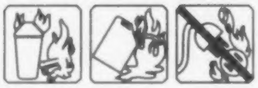
4.



5.



6.



7.

______ a. Class A and B fires but not Class C fires

______ b. Flammable liquids

______ c. Class B and Class C fires but not Class A fires

______ d. Ordinary combustibles

______ e. Class A fires but not Class B and C fires

______ f. Electrical equipment

______ g. Combustible metals

______ h. Yellow

______ i. Blue

______ j. Red

______ k. Green

Written Test

Objective 16

List the general guidelines for first aid emergencies.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

Objective 17

Complete statements concerning bloodborne pathogens and special first aid precautions by circling the correct answers.

a. Bloodborne pathogens include HIV and (**hepatitis B, hepatitis A**).

b. Treat all victims as if they (**were, were not**) infected because you cannot tell by looking at someone if they are infected with bloodborne pathogens.

c. Always wear (**leather, latex**) gloves as a barrier.

d. Use face masks with a one-way valve for protection when performing (**mouth-to-mouth breathing, the Heimlich maneuver**).

e. (**Do, Do not**) eat, drink, or touch your mouth, nose, or eyes when giving first aid.

f. When cleaning up, vigorously wash your skin in (**hot, soapy water, diluted bleach**).

g. Dispose of cleanup materials properly in (**plastic biohazard bags, regular garbage bags**).

Objective 18

Complete statements concerning guidelines for lifting and carrying items safely. Write the correct number on the blank provided before each item.

_____ a. Place your ________________ as close to the load as possible.

1) head
2) shoulders
3) hip
4) feet

_____ b. Do not ____________________ or twist your body to change direction.

1) set the load down
2) turn your head
3) change your grip
4) adjust your footing

_____ c. To set down the load, bend your ____________________.

1) arms
2) knees
3) back
4) head

Permission to duplicate this test is granted.

Answers to Written Test

Objective 1

a. 4
b. 2
c. 7
d. 5
e. 8
f. 1
g. 6
h. 3

Objective 2

b, c, g, i

Objective 3

a. Unsafe
b. Machinery
c. Materials
d. Tools
e. Combustible
f. Floors
g. Housekeeping
h. Cleanup

Objective 4

The following may be in any order.

a. Safety glasses
b. Earplugs
c. Face shields
d. Steel-toe shoes
e. Protective gloves

Objective 5

a, b

Objective 6

a. 3
b. 1
c. 4
d. 2
e. 2

Objective 7

The following may be in any order.

a. Mechanical
b. Fire
c. Chemical
d. Light
e. Noise

Objective 8

a, b, d

Objective 9

a, c

Objective 10

a. 4
b. 2
c. 5
d. 1
e. 3

Answers to Written Test

Objective 11	a, d, e
Objective 12	a. Fuel b. Heat c. Oxygen
Objective 13	a. 3 b. 2 c. 4 d. 1
Objective 14	a. 5 b. 4 c. 1 d. 3 e. 2
Objective 15	a. 7 b. 2 c. 5 d. 1 e. 6 f. 3 g. 4 h. 4 i. 3 j. 2 k. 1
Objective 16	a. Turn off power. b. Administer first aid. c. Reassure the injured person that everything possible is being done. d. Report all accidents and injuries to your instructor or jobsite supervisor. e. Make accurate notes about the accident.
Objective 17	a. Hepatitis B b. Were c. Latex d. Mouth-to-mouth breathing e. Do not f. Hot, soapy water g. Plastic biohazard bags
Objective 18	a. 4 b. 3 c. 2

Prerequisites:
None

Learning Activities Sheet

Student Name ______________________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

Optional

☐ 3. **View** Videotape entitled *Employee Safety Orientation.*

☐ 4. **Study** Information Sheet, Objectives 1 through 5.

☐ 5. **Do** Assignment Sheet 1, "Complete a Student Safety Pledge Form."

☐ 6. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 7. If the evaluation is not satisfactory, repeat step 5.

☐ 7. **Do** Assignment Sheet 2, "Survey the Shop and Identify Correct Safety Practices."

☐ 8. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 9. If the evaluation is not satisfactory, repeat step 7.

☐ 9. **Study** Information Sheet, Objective 6, and Student Supplement 1, "Guidelines for Interpreting Material Safety Data Sheets."

Optional

☐ 10. **View** Videotape entitled *Hazard Communications—Your Right to Know.*

☐ 11. **Do** Assignment Sheet 3, "Interpret a Material Safety Data Sheet."

Learning Activities Sheet

☐ 12. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 13. If the evaluation is not satisfactory, repeat steps 9 and 11.

☐ 13. **Study** Information Sheet, Objectives 7 through 11.

Optional 📼 ☐ 14. **View** Videotape entitled *OSHA's Hazardous Energy Source (Lockout/Tagout).*

☐ 15. **Do** Assignment Sheet 4, "Draw a Floor Plan and Locate Safety Equipment in Your Shop."

☐ 16. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 17. If the evaluation is not satisfactory, repeat step 15.

☐ 17. **Study** Information Sheet, Objectives 12 through 15.

Optional 📼 ☐ 18. **View** Videotape entitled *Fire Extinguisher Training and Use 2000.*

☐ 19. **Observe** Demonstration of procedures to be used in completing Job Sheet 1.

Note: If possible, observe a member of your local fire department demonstrate the proper use of several types of fire extinguishers. When completing this job sheet, be sure to use the safe area that the fire department established to put out fires.

☐ 20. **Do** Job Sheet 1, "Operate a Fire Extinguisher."

☐ 21. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 22. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 1 and repeat steps 17, 19 and 20.

☐ 22. **Study** Information Sheet, Objectives 16 and 17.

Optional 📼 ☐ 23. **View** Videotape entitled *Bloodborne Pathogens in the Workplace.*

Learning Activities Sheet

☐ 24. **Study** Information Sheet, Objective 18.

Optional 📼 ☐ 25. **View** Videotape entitled *Back Injury Prevention*.

☐ 26. **Observe** Demonstration of procedures to be used in completing Job Sheet 2.

☐ 27. **Do** Job Sheet 2, "Lift a Heavy Object Properly."

☐ 28. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 29. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 2 and repeat steps 24, 26, and 27.

☐ 29. **Check** With instructor for any additional assignments to be completed.

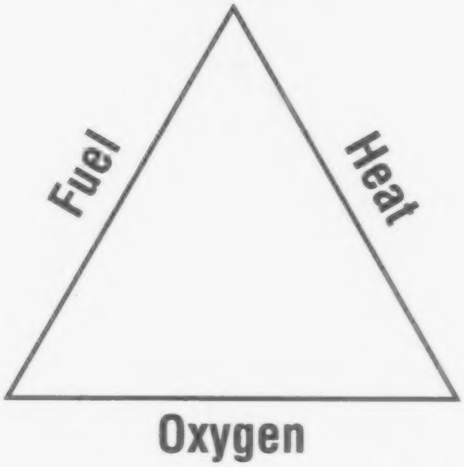
☐ 30. **Do** Additional assignments listed below.

☐ 31. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

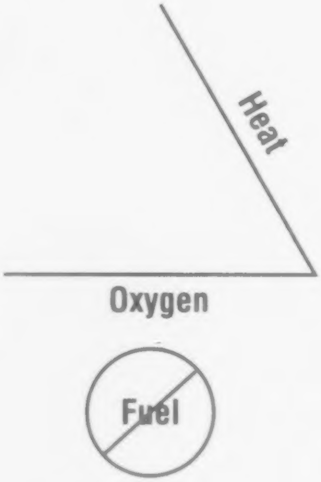
☐ 32. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

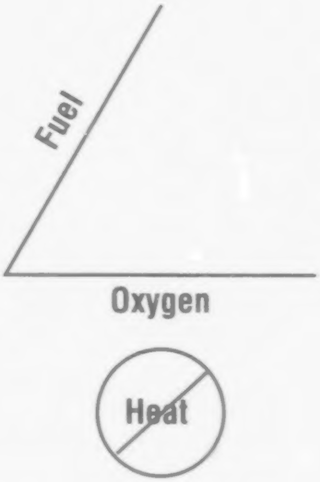
***Permission to duplicate this form is granted.**

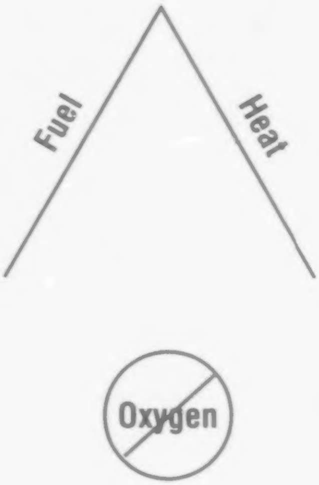
Components of the Fire Triangle


Fuel
Heat
Oxygen

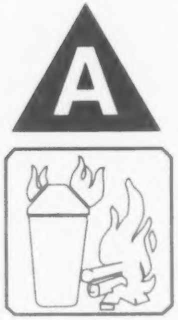
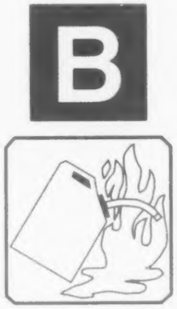
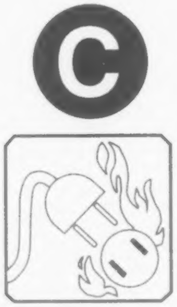
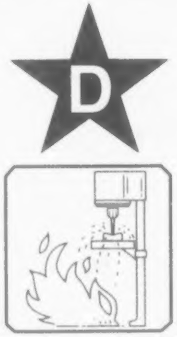
To produce fire, the three elements of the fire triangle must be present at the same time. If any one of the three is missing, a fire cannot be started. With the removal of any one element, the fire will be extinguished.


Heat
Oxygen
Fuel


Fuel
Oxygen
Heat


Fuel
Heat
Oxygen

Classes of Fires and Their Fire Extinguisher Symbols

	Class A (Green) • Ordinary combustibles		Class B (Red) • Flammable liquids and gases
	Class C (Blue) • Live electrical equipment		Class D (Yellow) • Combustible metals

Types of Fire Extinguishers

Type of Fire	Approved Type of Extinguisher				
	Pressurized Water	Carbon Dioxide	Multi-Purpose Dry Chemical	Halon Gas	Foam
Class A Fires ORDINARY COMBUSTIBLES • Wood • Paper • Cloth, etc.					
Class B Fires FLAMMABLE LIQUIDS, GREASE • Gasoline • Paints • Oils, etc.					
Class C Fires ELECTRICAL EQUIPMENT • Motors • Switches, etc.					
Class D Fires COMBUSTIBLE METALS • Magnesium • Phosphorus • Iron					

Unit Contents

Teacher Components

Teacher Page

Suggested Activities . . . 3–3

Answers to Assignment Sheets . . . 3–7

Pretest . . . 3–15

Written Test . . . 3–23

Answers to Pretest . . . 3–33

Answers to Written Test . . . 3–37

Learning Activities Sheet . . . 3–41

Transparency Masters

1—Graduations on a Rule . . . 3–45
2—Graduations on a Rule (continued) . . . 3–47
3—Reading Fourths on a Rule . . . 3–49
4—Reading Eighths on a Rule . . . 3–51
5—Reading Sixteenths on a Rule . . . 3–53

Student Components

Student Page

Objective Sheet . . . 3–3

Information Sheet . . . 3–5

Assignment Sheets

1—Add Whole Numbers . . . 3–27
2—Subtract Whole Numbers . . . 3–31
3—Multiply Whole Numbers . . . 3–35
4—Divide Whole Numbers . . . 3–39
5—Reduce Fractions to Lowest Terms . . . 3–43
6—Convert Fractions and Mixed Numbers . . . 3–45
7—Add Fractions . . . 3–47
8—Subtract Fractions . . . 3–51
9—Multiply Fractions . . . 3–57
10—Add Decimal Numbers . . . 3–59
11—Subtract Decimal Numbers . . . 3–63
12—Multiply Decimal Numbers . . . 3–67
13—Divide Decimal Numbers . . . 3–71

Unit Contents

14—Convert Fractions and Percentages 3–75
15—Solve Percentage Problems 3–79
16—Read a U.S. Customary Rule 3–83

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

Teaching Suggestions

- If a student has satisfactorily passed in a certain area(s) of the pretest, consider letting him/her skip studying the objective(s) and completing the assignment sheet that pertains to that area.
- Play "You Inherit" with the students to help them learn place values. Ask students to tell you the least amount they inherit when you give them the amount in numbers of digits.

  Examples: Q. "You have just inherited a six-digit sum. What is the least amount you inherit?"

  A. "One hundred thousand dollars."
- On different tables arrange groups of objects such as small tools, rolls of line tape, screws, sucker feet, and so forth to be added, subtracted, multiplied, divided, stated as a percentage, etc. Have students stop at each table and perform the math procedures indicated. Provide each student with a work sheet on which the equations and answers can be written.
- Have students play dominoes. Score ends in multiples of five and play to 250, or score ends at the end of each turn and play to 1,000 points.
- Develop or purchase sets of flashcards for the various math functions. Use the cards to review students in the math functions they need practice with.
- Sit students in a circle. Have all students clap hands twice on legs, then clap hands together twice, then snap fingers twice to establish a rhythm that is to continue unbroken throughout the games. The caller gives a multiplication (or other operation) problem such as 8x6 while snapping fingers, and at the next finger snapping says the name of someone to answer the problem. The responder gives the answer at the next finger snapping without breaking the clap/snap rhythm. If the responder breaks the rhythm or gives an incorrect answer, then he or she is out of the game. The last person left is the winner.
- Have students practice measuring using a ruler (located on line gauge) by measuring various items in the classroom or lab: size of masking sheet, size of plate, size of pads, etc. Have students record their measurements on a sheet of paper, and then have them convert their measurements to improper fractions. After they have improper fractions, have them give their lists to another student who then converts the improper fractions to mixed numbers.
- Assign monetary values to each letter of the alphabet: A=$.05, B=$.10, C=$.15, D=$.25, E=$1.00, Z=$20.00. Then have students calculate such problems as: Who has the most valuable name? What graphics software has the most valuable name? What piece of printing equipment has the most valuable name?

Suggested Activities

- Illustrate percentages by providing students with graph or grid paper. Have students outline at least eight 10 x 10 block squares. Since each block contains 100 units or small squares, students can shade in enough units to illustrate 25 percent, 33 $^1/_2$ percent, 50 percent, 96 percent, and so on.

Evaluation

- Make copies of the pretest and posttest. Add or modify test items as needed. The pretest and posttest assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- *Introduction to Automotive Service*, Unit A-4, "Apply Related Math and Measuring." Stillwater, OK: Curriculum and Instructional Materials Center/Oklahoma Department of Vocational and Technical Education, 1989.

Suggested Supplemental Resources

Print Media

- Kit: *How to Survive Fractions, Decimals, and Percents*

  Note: Print kit includes teacher's guide, two answer key booklets, heavy duty activity cards, and storage case. The software kit includes 400 math work problems in fractions, decimals, and percents to supplement the print kit. Order from EBSCO Curriculum Materials, Division of EBSCO Industries, Inc., Box 281, Chelsea, AL 35043-0281, or call 1-800-633-8623.

Answers to Assignment Sheets

Assignment Sheet 1

Add Whole Numbers

a.

1. 11
2. 16
3. 13
4. 23
5. 108
6. 88
7. 242
8. 1,538
9. 1,917
10. 16,430

b.

1. 20
2. 84
3. 1135
4. $609
5. 86
6. 53
7. 31
8. 423
9. 282
10. 108

Assignment Sheet 2

Subtract Whole Numbers

a.

1. 4
2. 7
3. 53
4. 406
5. 424
6. 283
7. 1,175
8. 1,810
9. 51,450
10. 89,722

b.

1. 126
2. 12
3. 23
4. 948
5. 38
6. 142
7. 210
8. 8
9. 123
10. Week 1 = 780 impressions
    Week 2 = 1089 impressions
    Week 3 = 1988 impressions
    Week 4 = 1089 impressions
    Week 5 = 1936 impressions

Assignment Sheet 3

Multiply Whole Numbers

a.

1. 42
2. 72
3. 324
4. 2,884
5. 8,410
6. 2,028
7. 21,291
8. 165,478
9. 503,605
10. 5,458,852

Answers to Assignment Sheets

b.

1. 32
2. 96
3. 3,000
4. 24
5. 128
6. $348
7. 315
8. 135
9. 1,440
10. 15,042

Assignment Sheet 4

Divide Whole Numbers

a.

1. 4
2. 8
3. 91
4. 312
5. 3
6. 3
7. 62, R4
8. 2, R97
9. 1, R365
10. 3, R634

b.

1. 11
2. $22
3. 104
4. 23
5. $936
6. 33

Assignment Sheet 5

Reduce Fractions to Lowest Terms

a. 1/2
b. 1/2
c. 1
d. 1/4
e. 1/4
f. 3/8
g. 1/2
h. 1/2
i. 3/4
j. 1/2

Assignment Sheet 6

Convert Fractions and Mixed Numbers

a.

1. P
2. M
3. I
4. M
5. P
6. I
7. I
8. M
9. I
10. M
11. M
12. I
13. I
14. P
15. M

b.

1. 13/4
2. 9/2
3. 31/4
4. 17/2
5. 49/8
6. 11/2
7. 17/4
8. 17/2
9. 37/4
10. 33/2

c.

1. 1 3/4
2. 4 1/2
3. 1 1/2
4. 1 7/8
5. 1 3/16
6. 1 3/8
7. 2 11/32
8. 2 1/2
9. 3 3/4
10. 2 1/16

Answers to Assignment Sheets

Assignment Sheet 7

Add Fractions

a.

1. 3/4
2. 1 1/2
3. 1/2
4. 1
5. 1 3/16
6. 25/32
7. 29/32
8. 1 1/4
9. 1 5/16
10. 1 25/32

b.

1. 14 3/4
2. 7 3/4
3. 7 3/16
4. 19 5/8
5. 13 1/16
6. 60 1/16
7. 6 13/16
8. 3 1/4
9. 17 1/16

Assignment Sheet 8

Subtract Fractions

a.

1. 9/16
2. 5/8
3. 3/16
4. 5/32
5. 3/4
6. 9/16
7. 1/16
8. 3/8
9. 17/32
10. 1/2

b.

1. 3 1/4
2. 6 1/16
3. 31 19/32
4. 174 1/5
5. 11 3/64

c.

1. 2/3
2. 1 5/8
3. 8 1/8
4. 1 11/32
5. 25 11/16
6. 7 1/4
7. 9/16
8. 1 1/16
9. 2/3
10. 38 9/16

d.

1. 2/5
2. 49 15/16
3. 5 2/3
4. 9 1/2
5. 27 1/8
6. 2 1/4
7. 2 1/8
8. 3 5/16
9. 2 1/2
10. 3 3/16

e.

1. 1/8
2. 3/4
3. 2 7/8
4. 10
5. 1 3/8
6. 6 11/20
7. 3 3/4
8. 8 5/8

Answers to Assignment Sheets

Assignment Sheet 9

Multiply Fractions

a.

1. 3/8
2. 3 3/8
3. 7/12
4. 1/24
5. 15/128
6. 3 1/4
7. 1 1/2
8. 16 27/32

b.

1. 1/4 gallon
2. 74 business cards
3. 4 1/3 pounds

Assignment Sheet 10

Add Decimal Numbers

a.

1. Tenths
2. Hundredths
3. Ten thousandths
4. Ten thousandths
5. Thousandths

b.

1. Hundredths
2. Ten thousandths
3. Tenths
4. Thousandths
5. Hundredths

c.

1. 46.3$\underline{8}$26
2. 35.003$\underline{8}$
3. 148.$\underline{2}$96
4. 6758.2$\underline{3}$
5. 91.40$\underline{8}$2
6. 2$\underline{0}$4.37
7. 1$\underline{4}$.0079
8. 208.0$\underline{9}$7
9. 5.23$\underline{9}$81
10. 502.$\underline{9}$67
11. 5230.86$\underline{7}$
12. 58$\underline{7}$.029
13. 0.2$\underline{9}$8
14. 3$\underline{2}$9.768
15. 52.69$\underline{4}$
16. 498.$\underline{2}$76
17. 0.529$\underline{6}$
18. 468.5$\underline{3}$9
19. 324.$\underline{0}$6
20. 56$\underline{7}$.8

d.

1. $$\begin{array}{r} 0.024 \\ +\,0.165 \\ \hline 0.189 \end{array}$$

2. $$\begin{array}{r} 87.3 \\ +\,370.0 \\ \hline 457.3 \end{array}$$

3. $$\begin{array}{r} 15.127 \\ 3.4 \\ .0091 \\ +\,236.87 \\ \hline 255.4061 \end{array}$$

4. $$\begin{array}{r} 195.7 \\ 83.0 \\ +\,9.006 \\ \hline 287.706 \end{array}$$

5. $$\begin{array}{r} .5280 \\ 435. \\ 179.50 \\ +\,1.9 \\ \hline 616.9280 \end{array}$$

e.

1. $39.00
2. $74.33
3. 23.9
4. 19.2
5. $16,018.26

Assignment Sheet 11

Subtract Decimal Numbers

a.

1. 351.98
2. 547.144
3. 141.013
4. 508.16
5. $749.25
6. $4.15
7. 670.4
8. 4,107.34
9. $2.47
10. $197.45

b.

1. $3317.32
2. 14.5
3. 2.84
4. 40.5
5. 27.5

Assignment Sheet 12

Multiply Decimal Numbers

a.

1. 8.184
2. 39.6
3. 1.1475
4. 297.5
5. 100.32
6. 6.4584
7. 0.4565
8. 25.38
9. 0.00069
10. 22.6352

BEST COPY AVAILABLE

b.

1. $337.45
2. $6187.50
3. .28
4. $16.95
5. $18.72
6. 67.2

Assignment Sheet 13

Divide Decimal Numbers

a.

1. 9
2. 12.4
3. 33
4. 153
5. 1.5
6. 284
7. 0.8
8. 0.5
9. 300
10. .4

b.

1. $8.64
2. 30.3
3. 32
4. $21.60
5. $4.78

Assignment Sheet 14

Convert Fractions and Percentages

a.

1. 0.125
2. 0.25
3. 0.5
4. 0.75
5. 0.625
6. 0.0625
7. 0.09375
8. 0.875
9. 0.5625
10. 0.9375

b.

1. 25%
2. 50%
3. 70%
4. 75%
5. 100%
6. 10%
7. 87.5%
8. 50%
9. 33.3%
10. 62.5%

c.

1. g
2. j
3. d
4. a
5. i
6. b
7. c
8. f
9. h
10. e

d.

1. 63.9
2. 5.93
3. 5.093
4. 5.0093
5. 3.825
6. 38.95
7. 38.095
8. 42.3
9. 402.3
10. 897.00097

e.

1. 1/2
2. 1/4
3. 1/3
4. 9/25
5. 7/25
6. 1/7
7. 21/100
8. 3/4
9. 2/3
10. 7/10

f.

1. .47
2. .15
3. .333
4. .62
5. .75
6. .03
7. .168
8. .09
9. .10
10. .50

Assignment Sheet 15

Solve Percentage Problems

a. All work completed
b. 14%
c. 86, 86%
d. 25%
e. 94%
f. 6, 6%
g. 89%
h. 94%
i. 40%
j. 50%
k. 5%
l. 38%
m. 25%
n. 60%
o. 7%

p.
1. 2.16
2. 0.9
3. 32
4. 50
5. 43.18
6. 17.6
7. 1.03
8. 57
9. 16.4
10. 11.41

q.
1. 12
2. 1
3. $24.00
4. 600

Assignment Sheet 16

Read a U.S. Customary Rule

a.
1. 1/4"
2. 1/2"
3. 1 1/4"
4. 1 3/4"
5. 1 1/4"
6. 2 1/2"
7. 1 1/4"
8. 2 1/2"
9. 1 1/2"
10 4"

b.
1. 3/8"
2. 1/4"
3. 1 1/8"
4. 3/4"
5. 1 1/2"
6. 2 3/4"
7. 1/2"
8. 2"
9. 4 1/4"
10. 2 3/8"

Answers to Assignment Sheets

c. 1. 15/16″
2. 1/2″
3. 1 13/16″
4. 3/4″
5. 1 11/16″
6. 3 5/16″
7. 1 1/2″
8. 2 5/8″
9. 4 1/4″
10. 1 5/8″

d. 1. 25/32″
2. 1 5/32″
3. 3/8″
4. 1 27/32″
5. 1 9/16″
6. 1 1/2″
7. 1 3/16″
8. 2 13/16″
9. 4 9/32″
10. 1 15/16″

Pretest

Name ____

Date ______________________________ Score __________

1 Select correct definitions of math terms. Write a "T" in the blank before each correct definition.

_____ a. **Fraction** is part of a whole; it represents one or more equal parts of a unit.

_____ b. **Digit** is any of the natural numbers, both positive and negative, that represents a complete item.

_____ c. **Subtraction** is the opposite (inverse) operation of addition.

_____ d. **Whole number (integer)** is any of the ten symbols, 0 to 9, by which all numbers can be expressed.

_____ e. **Percent** is a fraction with an unwritten denominator of 10 or some power of 10; indicated with a point before the number.

_____ f. **Multiplication** is an abbreviated process of adding a number to itself a specified number of times.

_____ g. **Decimal** is one part in a hundred; reckoned on the basis of a whole divided into one hundred parts.

_____ h. **Division** is the opposite (inverse) operation of multiplication.

_____ i. **Liter** is the metric unit used to measure capacity.

_____ j. **Ratio** is being relatively equal in size or quantity.

_____ k. **Addition** is the process of totaling two or more numbers to find another number called a sum.

_____ l. **Meter** is the metric unit used to measure length.

_____ m. **Proportional** is the relationship in quantity, amount, or size between two or more things.

Pretest

2

Match symbols used in basic math with their correct names. Write the correct numbers in the blanks.

1. .
2. %
3. :
4. ⟌
5. =
6. x
7. −
8. ÷
9. +

_____ a. Plus sign (addition)

_____ b. Equal sign

_____ c. Division frame

_____ d. Ratio symbol

_____ e. Minus sign (subtraction)

_____ f. Percent symbol

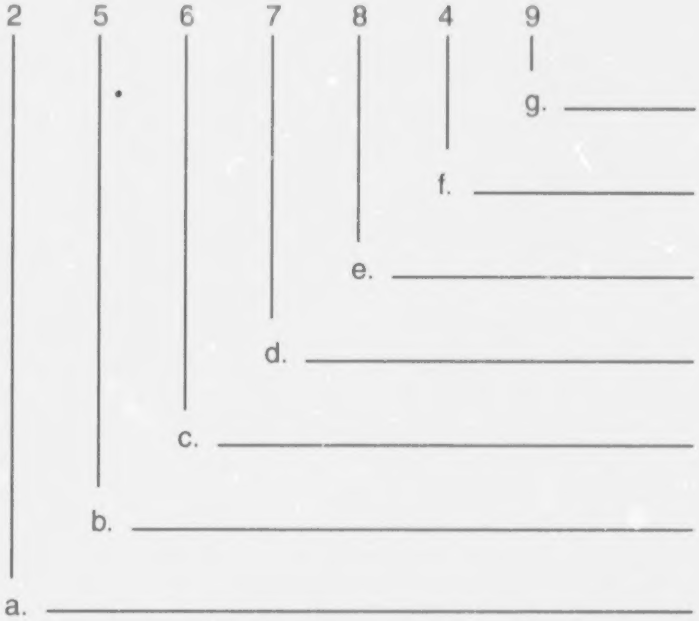
_____ g. Times sign (multiplication)

_____ h. Decimal point

_____ i. Division sign

3

Label the place values in the whole number below.


2 5 6 7 8 4 9
g. ____________
f. ________________
e. ____________________
d. ________________________
c. ____________________________
b. ________________________________
a. ____________________________________

4 Add whole numbers to solve the following problems.

a. $\begin{array}{r} 7 \\ \underline{+\ 11} \end{array}$

b. $\begin{array}{r} 5 \\ 10 \\ \underline{+\ 15} \end{array}$

c. $\begin{array}{r} 40 \\ 159 \\ \underline{+\ 200} \end{array}$

5 Subtract whole numbers to solve the following problems.

a. $\begin{array}{r} 8 \\ \underline{-\ 3} \end{array}$

b. $\begin{array}{r} 47 \\ \underline{-\ 22} \end{array}$

c. $\begin{array}{r} 477 \\ \underline{-\ 222} \end{array}$

6 Multiply whole numbers to solve the following problems.

a. $\begin{array}{r} 6 \\ \underline{\times\ 3} \end{array}$

b. $\begin{array}{r} 75 \\ \underline{\times\ 56} \end{array}$

c. $\begin{array}{r} 424 \\ \underline{\times\ 138} \end{array}$

7 Divide whole numbers to solve the following problems.

a. $3\overline{)96}$

b. $24\overline{)96}$

c. $135\overline{)541}$

8 Distinguish among types of fractions. Write a "P" in the blanks before the proper fractions, an "I" before improper fractions, and an "M" before mixed numbers.

_____ a. 5/3

_____ b. 3/8

_____ c. 20/100

_____ d. 1 3/15

_____ e. 5/5

9 Reduce the following fractions to lowest terms. Write your answers in the blanks.

_____ a. 2/8

_____ b. 4/32

_____ c. 5/25

_____ d. 8/32

_____ e. 9/81

Pretest

10 Convert the following mixed numbers to improper fractions. Reduce to lowest terms. Write your answers in the blanks.

_____ a. $2\,{}^{1}/_{4}$

_____ b. $6\,{}^{7}/_{8}$

_____ c. $15\,{}^{5}/_{10}$

11 Convert the following improper fractions to mixed numbers. Reduce to lowest terms. Write your answers in the blanks.

_____ a. ${}^{27}/_{4}$

_____ b. ${}^{63}/_{8}$

_____ c. ${}^{221}/_{6}$

12 Add fractions to solve the following problems. Convert to mixed numbers if necessary, and reduce to lowest terms. Write your answers in the blanks.

_____ a. ${}^{2}/_{8} + {}^{5}/_{8}$

_____ b. ${}^{7}/_{16} + 5\,{}^{1}/_{4}$

_____ c. $4\,{}^{1}/_{2} + 8\,{}^{1}/_{16}$

13 Subtract fractions to solve the following problems. Reduce to lowest terms. Write your answers in the blanks.

_____ a. ${}^{5}/_{8} - {}^{3}/_{8}$

_____ b. ${}^{15}/_{16} - {}^{3}/_{8}$

_____ c. $3\,{}^{5}/_{8} - 2\,{}^{3}/_{16}$

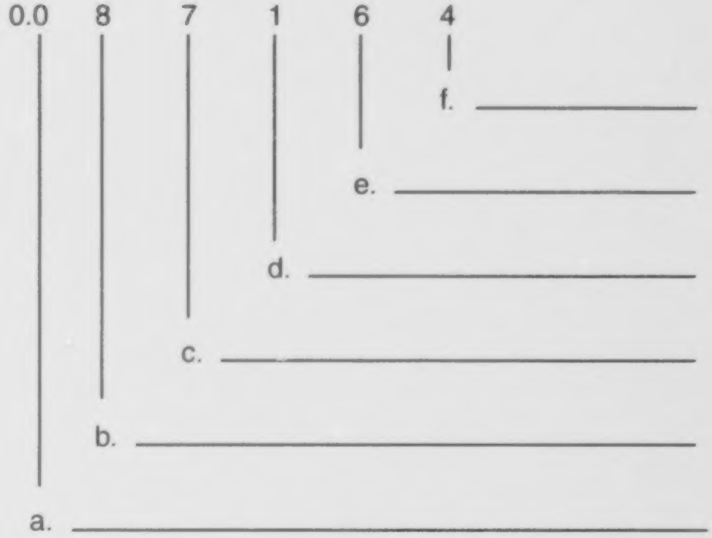
14 Multiply fractions to solve the following problems. Reduce to lowest terms. Write your answers in the blanks.

_____ a. ${}^{3}/_{4}$ x ${}^{5}/_{8}$

_____ b. ${}^{3}/_{8}$ x $5\,{}^{1}/_{4}$

_____ c. $8\,{}^{1}/_{2}$ x $2\,{}^{3}/_{4}$

15 Label the place values in the decimal number below.



16 Add decimal numbers to solve the following problems. Write your answers in the blanks.

_____ a. $7.32 + $.68 + $4.39

_____ b. 8.40 + 0.87

_____ c. 64.018 + .0473

17 Subtract decimal numbers to solve the following problems. Write your answers in the blanks.

_____ a. $16.20 – $8.10

_____ b. 41.032 – 20.008

_____ c. 0.7964 – 0.4431

18 Multiply decimal numbers to solve the following problems. Write your answers in the blanks.

_____ a. 4.5 x 7.5

_____ b. .248 x 00.45

_____ c. 8.064 x 3.435

Pretest

19 Divide decimal numbers to solve the following problems. Write your answers in the blanks.

_____ a. 3.15 ÷ 0.7

_____ b. 6.25 ÷ 0.05

_____ c. 72 ÷ .085

20 Convert the following decimal fractions to common fractions. Write your answers in the blanks.

_____ a. .8

_____ b. .35

_____ c. .840

21 Convert the following common fractions to decimal numbers and percentages. Give percentages in the nearest whole percent. Write your answers in the blanks.

Decimals	Percentages		
________	________	a.	3/4
________	________	b.	5/14
________	________	c.	26 6/100

22 Convert the following percentages to fractions and decimal numbers. Write your answers in the blanks.

Decimals	Fractions		
________	________	a.	15%
________	________	b.	40%
________	________	c.	125%

23 Solve the following percentage problems. Write your answers in the blanks.

_____ a. If a company paid a press operator $150 which is 80 percent of her salary, how much more money would the company still owe?

_____ b. If 15 percent of the paper is stolen, how may reams of paper will be left of the 2400 stored for the job?

_____ c. If Jake bought equipment for $48,000 and sold it for $60,000 what was his percentage of profit?

24

Solve the following story problems. Write your answers in the blanks.

_____ a. In the first year of operation, a printing shop handled 1219 jobs. During the second year, the number of jobs increased to 2167. How many more jobs did the shop handle the second year?

_____ b. To design three business cards takes 65 minutes. If you have already worked 27 minutes, how much longer will you need to work?

_____ c. A camera operator has 9 boxes of film for use as needed. He has ordered and received 8 additional boxes. How many total boxes does he have in stock?

_____ d. A prepress foreman ordered the following number of plates at different dates: 256, 62, 575, and 242. How many plates should she be billed for?

_____ e. It takes 35 minutes to print a box of envelopes. How many minutes does it take to print 9 orders consisting of one box of envelopes each?

_____ f. How many jobs that require 4 masking sheets to complete each job can be stripped using a case containing 416 masking sheets?

_____ g. If a can of ink holds 5 pounds, how many cans may be filled from a 55-gallon drum?

_____ h. There are 500 sheets of paper in a ream. How many are in 6 reams?

_____ i. What is the combined length of two bolts that measure 3 1/2 inches and 4 1/4 inches?

_____ j. Samuel worked 4 1/2 hours before lunch and 4 3/4 hours after lunch. How many hours did Samuel work?

_____ k. What is the combined length of three tools measuring 2 1/8 inches, 3 1/4 inches, and 1 13/16 inches?

_____ l. Sarah had a 7/8-inch wrench. She needed a 3/4-inch wrench. How much difference is there in the size of the wrenches?

_____ m. 5 1/4 hours are how many more than 2 1/2 hours?

_____ n. If you had to reduce a 15/16-inch part by 7/8 inch, how much would you have to reduce it?

_____ o. On a printing job, paper costs $54.65, labor costs $16.30, and tax costs $3.38. What is the total cost of the job?

_____ p. In one month, a printing shop had the following expenses: paper, $429.33; electric bill, $160.16; telephone, $116.27; and labor, $40,312.50. What was the shop's monthly expenditure?

_____ q. A printing shop received $8438.64 this month and paid out $5121.32. How much profit did the shop make?

_____ r. It takes 20.5 hours to finish a job. Mary has worked 6 hours. How many hours will it take her to finish the job?

_____ s. The average cost of roller installation is $41.25. During the year, the press operator installs 150 rollers. What was the total cost?

_____ t. A bindery manager buys 38 binders at a cost of $3.49 each. What is the total cost?

_____ u. If a can of black ink costs $6.00 per pound, how much will 58 pounds of black ink cost?

_____ v. Naoki received $361.00 for a press job. He worked 19 hours on the job. How much money did he make per hour?

_____ w. An apprentice press operator is paid $729.00 for 13.5 weeks of work. Find the average earnings per week for the apprentice.

_____ x. If 32 publications can be printed in 3.9 days, how many publications can be printed in 1 day? Round your answer to the nearest tenth.

***Permission to duplicate this test is granted.**

Written Test

Name ____

Date ______________________________ Score __________

Objective 1

Match the terms with their definitions.

1. Digit
2. Multiplication
3. Meter
4. Liter
5. Subtraction
6. Whole number (integer)
7. Addition
8. Fraction
9. Ratio
10. Proportional
11. Division
12. Decimal
13. Percent

_____ a. Process of totaling two or more numbers to find another number called a sum

_____ b. Fraction with an unwritten denominator of 10 or some power of 10; indicated with a point before the number

_____ c. Any one of the ten symbols, 0 to 9, by which all numbers can be expressed

_____ d. Opposite (inverse) operation of multiplication

_____ e. Part of a whole; represents one or more equal parts of a unit

_____ f. Any of the natural numbers, both positive and negative, that represents a complete item

_____ g. Abbreviated process of adding a number to itself a specified number of times

_____ h. Metric unit used to measure capacity

_____ i. One part in a hundred; reckoned on the basis of a whole divided into one hundred parts

_____ j. Metric unit used to measure length

_____ k. Being relatively equal in size or quantity

_____ l. Relationship in quantity, amount, or size between two or more things.

_____ m. Opposite (inverse) operation of addition

Written Test

Objective 2

Match symbols used in basic math with their correct names. Write the correct numbers in the blanks.

1. .
2. %
3. :
4.)‾‾‾
5. =
6. x
7. –
8. ÷
9. +

_____ a. Plus sign (addition)

_____ b. Equal sign

_____ c. Division frame

_____ d. Ratio symbol

_____ e. Minus sign (subtraction)

_____ f. Percent symbol

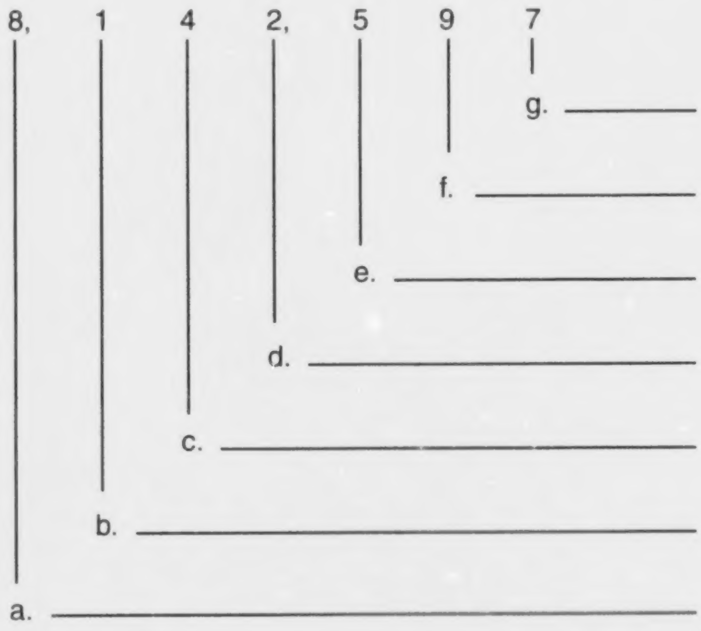
_____ g. Times sign (multiplication)

_____ h. Decimal point

_____ i. Division sign

Objective 3

Label the place values in the whole number below.



Written Test

Objective 4

Add whole numbers to solve the following problems.

a.	2	b.	5	c.	12	d.	142	e.	2345
	+ 9		7		17		759		9764
			+ 8		+ 99		+ 896		+ 8976

Objective 5

Subtract whole numbers to solve the following problems.

a.	9	b.	35	c.	481	d.	684	e.	9867
	− 7		− 9		− 79		− 342		− 8748

Objective 6

Multiply whole numbers to solve the following problems.

a.	7	b.	68	c.	735	d.	649	e.	8673
	x 5		x 9		x 68		x537		x 642

Objective 7

Divide whole numbers to solve the following problems.

a. $4\overline{)48}$ b. $16\overline{)64}$ c. $38\overline{)608}$

d. $421\overline{)842}$ e. $317\overline{)4569}$ f. $530\overline{)80960}$

Objective 8

Distinguish among types of fractions. Write a "P" in the blanks before the proper fractions, an "I" before improper fractions, and an "M" before mixed numbers.

_____ a. 1/2 _____ e. 5 3/16 _____ i. 1/4

_____ b. 8 3/4 _____ f. 10/32 _____ j. 99/1

_____ c. 8/8 _____ g. 2/8

_____ d. 15 3/8 _____ h. 6 1/2

Written Test

Objective 9

Reduce the following fractions to lowest terms. Write your answers in the blanks.

_____ a. 4/8

_____ b. 8/16

_____ c. 7/16

_____ d. 8/32

_____ e. 12/32

_____ f. 4/16

_____ g. 2/16

_____ h. 8/64

_____ i. 12/16

_____ j. 31/32

Objective 10

Convert the following fractions and mixed numbers.

a. Convert to improper fractions. Reduce to lowest terms if possible. Write your answers in the blanks.

_____ (1) 3 1/2

_____ (2) 4 2/4

_____ (3) 3 6/8

_____ (4) 12 4/8

_____ (5) 13 13/32

b. Convert the following improper fractions to mixed numbers. Reduce answers to lowest terms. Write your answers in the blanks.

_____ (1) 47/8

_____ (2) 21/9

_____ (3) 108/23

_____ (4) 54/5

_____ (5) 112/7

Objective 11

Add fractions to solve the following problems. Convert to mixed numbers if necessary, and reduce to lowest terms. Write your answers in the blanks.

_____ a. 1/8 + 5/8

_____ b. 1/16 + 15/16

_____ c. 2/4 + 3/4

_____ d. 1/2 + 4/8

_____ e. 4/8 + 2/4

_____ f. 7/8 + 6/16

_____ g. 2 1/8 + 7 1/4

_____ h. 3 2/4 + 16 1/8

_____ i. 4 2/4 + 8 2/8

_____ j. 5 1/8 + 6 2/16

Objective 12

Subtract fractions to solve the following problems. Reduce to lowest terms. Write your answers in the blanks.

_____ a. $4/8 - 3/8$

_____ b. $6/8 - 2/8$

_____ c. $9/16 - 4/16$

_____ d. $3/8 - 1/4$

_____ e. $3/8 - 1/8$

_____ f. $14/16 - 7/8$

_____ g. $2\ 3/4 - 1\ 1/4$

_____ h. $6\ 1/8 - 2\ 1/2$

_____ i. $9\ 2/4 - 4\ 1/2$

_____ j. $12\ 6/8 - 7\ 1/8$

Objective 13

Multiply fractions to solve the following problems. Reduce to lowest terms. Write your answers in the blanks.

_____ a. $1/2 \times 3/4$

_____ b. $3/4 \times 3/8$

_____ c. $3/2 \times 1/6$

_____ d. $3/4 \times 6\ 1/2$

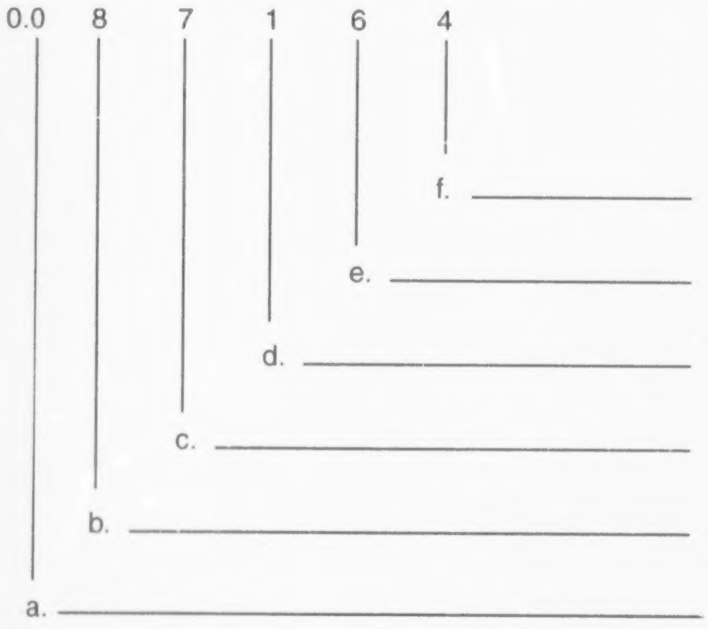
_____ e. $6\ 3/4 \times 8\ 3/4$

_____ f. $7\ 1/8 \times 1\ 1/2$

_____ g. $77/16 \times 5$

Objective 14

Label the place values in the decimal number below.



BEST COPY AVAILABLE

Written Test

Objective 15

Add decimal numbers to solve the following problems. Set up each problem and show your work. Write your answers in the blanks.

_____ a. 3.5 + 5.1 + 7

_____ b. 3.4 + 0.206 + 1.74

_____ c. $6.86 + $5.05 + $7.90 + $.82

_____ d. 57.78 + 0.22 + 0.003 + 74

_____ e. 6319 + 95.12 + 0.0713 + 321.07

Objective 16

Subtract decimal numbers to solve the following problems. Set up each problem and show your work. Write your answers in the blanks.

_____ a. $6.10 – $2.20

_____ b. $5.40 – $2.32

_____ c. $7.38 – $.63

_____ d. 0.835325 – 0.25

_____ e. 0.609375 – 0.359375

Objective 17

Multiply decimal numbers to solve the following problems. Set up each problem and show your work. Write your answers in the blanks.

_____ a. 2.6 x 4.7

_____ b. 0.119 x 0.05

_____ c. 9 x 0.08

_____ d. 7.392 x 92.07

_____ e. 9.5 x 0.76

Objective 18

Divide decimal numbers to solve the following problems. Set up each problem and show your work. Write your answers in the blanks.

_____ a. 5.32 ÷ 0.4

_____ b. 83.4 ÷ 0.6

_____ c. 7.75 ÷ 0.25

_____ d. 0.921 ÷ 0.3

_____ e. 0.0225 ÷ 0.15

_____ f. 24 ÷ 0.2

_____ g. 54 ÷ 0.09

Written Test

_____ h. 63 ÷ 0.007

_____ i. 812 ÷ 0.058

_____ j. 4125 ÷ 0.040

Objective 19

a. Convert the following decimal fractions to common fractions. Write your answers in the blanks.

_____ (1) .6

_____ (2) .55

_____ (3) .09

_____ (4) .650

_____ (5) .925

b. Convert the following percentages to fractions and decimal numbers. Write your answers in the blanks.

Fraction	Decimal		
_____	_____	(1)	12%
_____	_____	(2)	30%
_____	_____	(3)	45%
_____	_____	(4)	72%
_____	_____	(5)	250%

Objective 20

Solve the following percentage problems. Write your answers in the blanks.

_____ a. If a company paid a press operator $150, which is 87 percent of his salary, how much more money would the press operator have coming?

_____ b. If 12 percent of the paper for a job is stolen, how many reams of paper will be left of the 2100 reams stored for the job?

_____ c. If Rochelle bought $24,000 worth of equipment and sold it for $30,000, what was her percentage of profit?

*Permission to duplicate this test is granted.

Answers to Pretest

1 a, c, f, h, i, k, l

2
a. 9
b. 5
c. 4
d. 3
e. 7
f. 2
g. 6
h. 1
i. 8

3
a. Millions
b. Hundred thousands
c. Ten thousands
d. Thousands
e. Hundreds
f. Tens
g. Units

4
a. 18
b. 30
c. 399

5
a. 5
b. 25
c. 255

6
a. 18
b. 4200
c. 58512

7
a. 32
b. 4
c. 4 with 1 R

8
a. I
b. P
c. P
d. M
e. I

9
a. 1/4
b. 1/8
c. 1/5
d. 1/4
e. 1/9

Answers to Pretest

10	a.	9/4
	b.	55/8
	c.	155/10
11	a.	6 3/4
	b.	7 7/8
	c.	36 5/6
12	a.	7/8
	b.	5 11/16
	c.	12 9/16
13	a.	1/4
	b.	9/16
	c.	1 7/16
14	a.	15/32
	b.	1 31/32
	c.	23 3/8
15	a.	Tenths
	b.	Hundredths
	c.	Thousands
	d.	Ten thousandths
	e.	Hundred thousandths
	f.	Millionths
16	a.	$12.39
	b.	9.27
	c.	64.0653
17	a.	$8.10
	b.	21.024
	c.	0.3533
18	a.	33.75
	b.	.11160
	c.	27.699840
19	a.	4.5
	b.	125
	c.	847.05882
20	a.	4/5
	b.	7/20
	c.	21/25
21	a.	0.75; 75%
	b.	.3572; 36%
	c.	26.06; 2606%

22

a. 0.15; 3/20
b. 0.40, 2/5
c. 1.25; 1 1/4

23

a. $37.50
b. 2040 reams
c. 20 percent

24

a. 948
b. 38
c. 17
d. 1135
e. 315
f. 104
g. 11
h. 3000
i. 7 3/4
j. 9 1/4
k. 7 3/16
l. 1/8
m. 2 3/4
n. 1/16
o. 74.33
p. 41,018.26
q. $3317.32
r. 14.5
s. $6187.50
t. $132.62
u. $348
v. $19
w. $54
x. 8.2

Answers to Written Test

Objective 1

a. 7
b. 12
c. 1
d. 11
e. 8
f. 6
g. 2
h. 4
i. 13
j. 3
k. 10
l. 9
m. 5

Objective 2

a. 9
b. 5
c. 4
d. 3
e. 7
f. 2
g. 6
h. 1
i. 8

Objective 3

a. Millions
b. Hundred thousands
c. Ten thousands
d. Thousands
e. Hundreds
f. Tens
g. Units

Objective 4

a. 11
b. 20
c. 128
d. 1,797
e. 21,085

Objective 5

a. 2
b. 26
c. 402
d. 342
e. 1,119

Objective 6

a. 35
b. 612
c. 49,980
d. 348,513
e. 5,568,066

Objective 7

a. 12
b. 4
c. 16
d. 2
e. 14, R131
f. 152, R400

Objective 8

a. P
b. M
c. I
d. M
e. M
f. P
g. P
h. M
i. P
j. I

Objective 9

a. 1/2
b. 1/2
c. 7/16
d. 1/4
e. 3/8
f. 1/4
g. 1/8
h. 1/8
i. 3/4
j. 31/32

Answers to Written Test

Objective 10	a. (1)	7/2	(4)	25/2				
	(2)	9/2	(5)	429/32				
	(3)	15/4						
	b. (1)	5 7/8	(4)	10 4/5				
	(2)	2 1/3	(5)	16				
	(3)	4 16/23						
Objective 11	a.	3/4	d.	1	g.	9 3/8	j.	11 1/4
	b.	1	e.	1	h.	19 5/8		
	c.	1 1/4	f.	1 1/4	i.	12 3/4		
Objective 12	a.	1/8	d.	1/8	g.	1 1/2	j.	5 5/8
	b.	1/2	e.	1/4	h.	3 5/8		
	c.	5/16	f.	0	i.	5		
Objective 13	a.	3/8	e.	59 1/16				
	b.	9/32	f.	10 11/16				
	c.	1/4	g.	24 1/16				
	d.	4 7/8						
Objective 14	a.	Tenths						
	b.	Hundredths						
	c.	Thousandths						
	d.	Ten thousandths						
	e.	Hundred thousandths						
	f.	Millionths						
Objective 15	a.	15.6	d.	132.003				
	b.	5.346	e.	6735.2613				
	c.	$20.63						
Objective 16	a.	$3.90	d.	0.585325				
	b.	$3.08	e.	0.25				
	c.	$6.75						
Objective 17	a.	12.22	d.	680.58144				
	b.	0.00595	e.	7.22				
	c.	0.72						
Objective 18	a.	13.3	d.	3.07	g.	600	j.	103,125
	b.	139	e.	0.15	h.	9,000		
	c.	31	f.	120	i.	14,000		

Answers to Written Test

Objective 19

a.
- (1) 3/5
- (2) 11/20
- (3) 9/100
- (4) 13/20
- (5) 37/40

b.
- (1) 3/25; 0.12
- (2) 3/10; 0.30
- (3) 9/20; 0.45
- (4) 18/25; 0.72
- (5) 2 1/2; 2.50

Objective 20

a. $22.41
b. 1848 reams
c. 20 percent

Prerequisites:
None

Learning Activities Sheet

Student Name ____________________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

📖 ☐ 2. **Read** Objective Sheet.

☐ 3. **Study** Information Sheet, Objectives 1 through 4.

☐ 4. **Do** Assignment Sheet 1, "Add Whole Numbers."

☐ 5. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 6. If the evaluation is not satisfactory, repeat steps 3 and 4.

☐ 6. **Study** Information Sheet, Objective 5.

☐ 7. **Do** Assignment Sheet 2, "Subtract Whole Numbers."

☐ 8. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 9. If the evaluation is not satisfactory, repeat steps 6 and 7.

☐ 9. **Study** Information Sheet, Objective 6.

☐ 10. **Do** Assignment Sheet 3, "Multiply Whole Numbers."

☐ 11. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 12. If the evaluation is not satisfactory, repeat steps 9 and 10.

☐ 12. **Study** Information Sheet, Objective 7.

☐ 13. **Do** Assignment Sheet 4, "Divide Whole Numbers."

☐ 14. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 16. If the evaluation is not satisfactory, repeat steps 12 and 13.

☐ 15. **Study** Information Sheet, Objectives 8 and 9.

☐ 16. **Do** Assignment Sheet 5, "Reduce Fractions to Lowest Terms."

☐ 17. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 18. If the evaluation is not satisfactory, repeat steps 15 and 16.

☐ 18. **Study** Information Sheet, Objective 10.

☐ 19. **Do** Assignment Sheet 6, "Convert Fractions and Mixed Numbers."

☐ 20. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 21. If the evaluation is not satisfactory, repeat steps 18 and 19.

☐ 21. **Study** Information Sheet, Objective 11.

☐ 22. **Do** Assignment Sheet 7, "Add Fractions."

☐ 23. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 24. If the evaluation is not satisfactory, repeat steps 21 and 22.

☐ 24. **Study** Information Sheet, Objective 12.

☐ 25. **Do** Assignment Sheet 8, "Subtract Fractions."

☐ 26. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 27. If the evaluation is not satisfactory, repeat steps 24 and 25.

☐ 27. **Study** Information Sheet, Objective 13.

☐ 28. **Do** Assignment Sheet 9, "Multiply Fractions."

☐ 29. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 30. If the evaluation is not satisfactory, repeat steps 27 and 28.

☐ 30. **Study** Information Sheet, Objectives 14 and 15.

☐ 31. **Do** Assignment Sheet 10, "Add Decimal Numbers."

☐ 32. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 33. If the evaluation is not satisfactory, repeat steps 30 and 31.

☐ 33. **Study** Information Sheet, Objective 16.

☐ 34. **Do** Assignment Sheet 11, "Subtract Decimal Numbers."

☐ 35. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 36. If the evaluation is not satisfactory, repeat steps 33 and 34.

☐ 36. **Study** Information Sheet, Objective 17.

☐ 37. **Do** Assignment Sheet 12, "Multiply Decimal Numbers."

☐ 38. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 39. If the evaluation is not satisfactory, repeat steps 36 and 37.

☐ 39. **Study** Information Sheet, Objective 18.

☐ 40. **Do** Assignment Sheet 13, "Divide Decimal Numbers."

☐ 41. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 42. If the evaluation is not satisfactory, repeat steps 39 and 40.

☐ 42. **Study** Information Sheet, Objective 19.

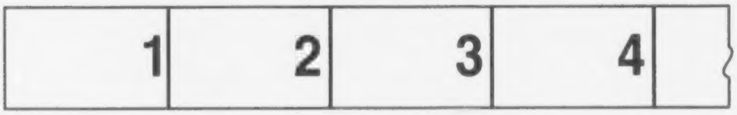
Learning Activities Sheet

☐ 43.	**Do**	Assignment Sheet 14, "Convert Fractions and Percentages."
☐ 44.	**Stop**	Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 45. If the evaluation is not satisfactory, repeat steps 42 and 43.
☐ 45.	**Study**	Information Sheet, Objective 20.
☐ 46.	**Do**	Assignment Sheet 15, "Solve Percentage Problems."
☐ 47.	**Stop**	Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 48. If the evaluation is not satisfactory, repeat steps 45 and 46.
☐ 48.	**Do**	Assignment Sheet 16, "Read a U.S. Customary Rule."
☐ 49.	**Stop**	Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 50. If the evaluation is not satisfactory, repeat step 48.
☐ 50.	**Check**	With instructor for any additional assignments to be completed.
☐ 51.	**Take**	Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.
☐ 52.	**Stop**	Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

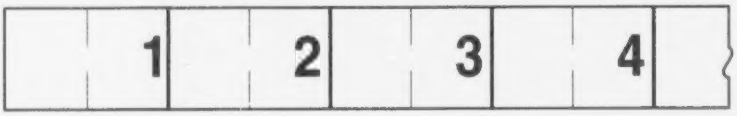
***Permission to duplicate this form is granted.**

Graduations on a Rule

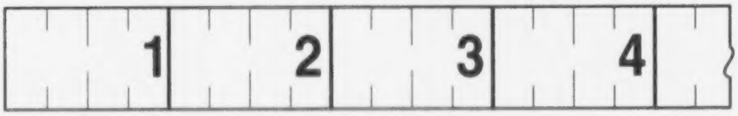
Inches



Halves

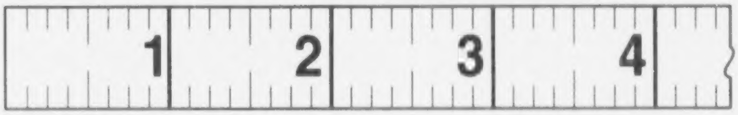


Quarters or Fourths

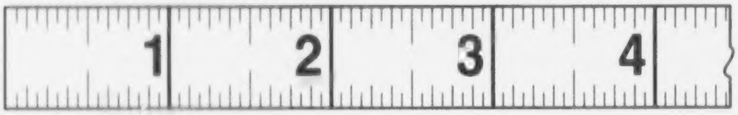


Graduations on a Rule (continued)

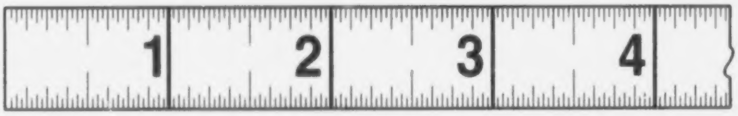
Eighths



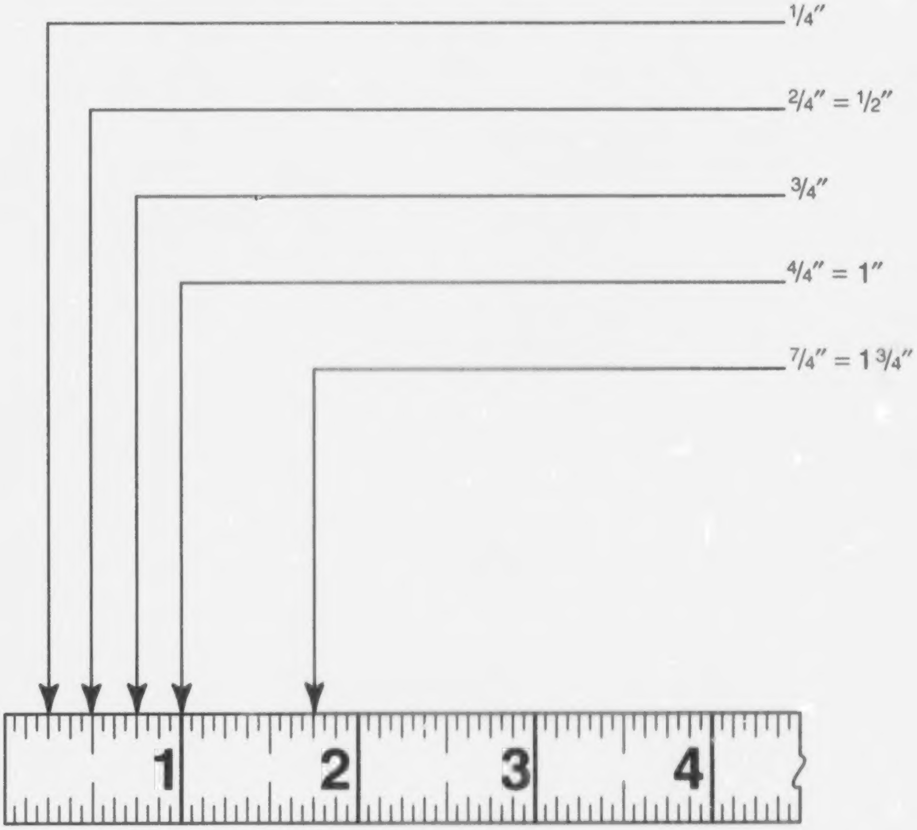
Sixteenths



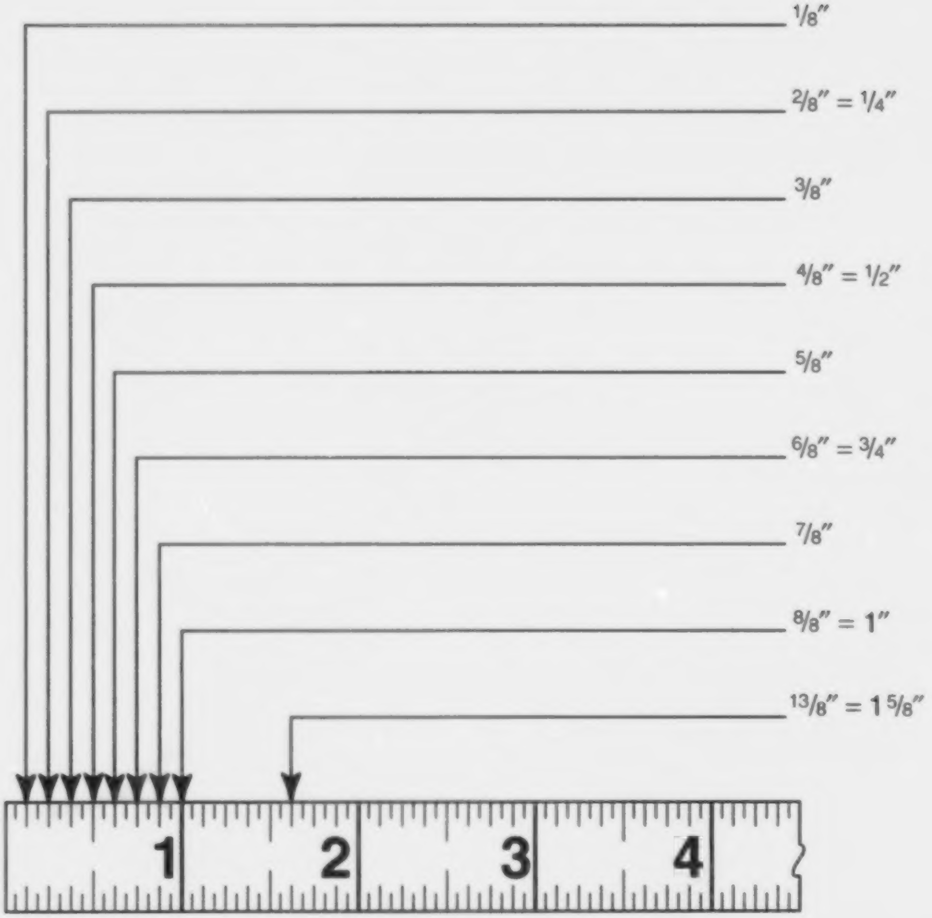
Thirty-Seconds



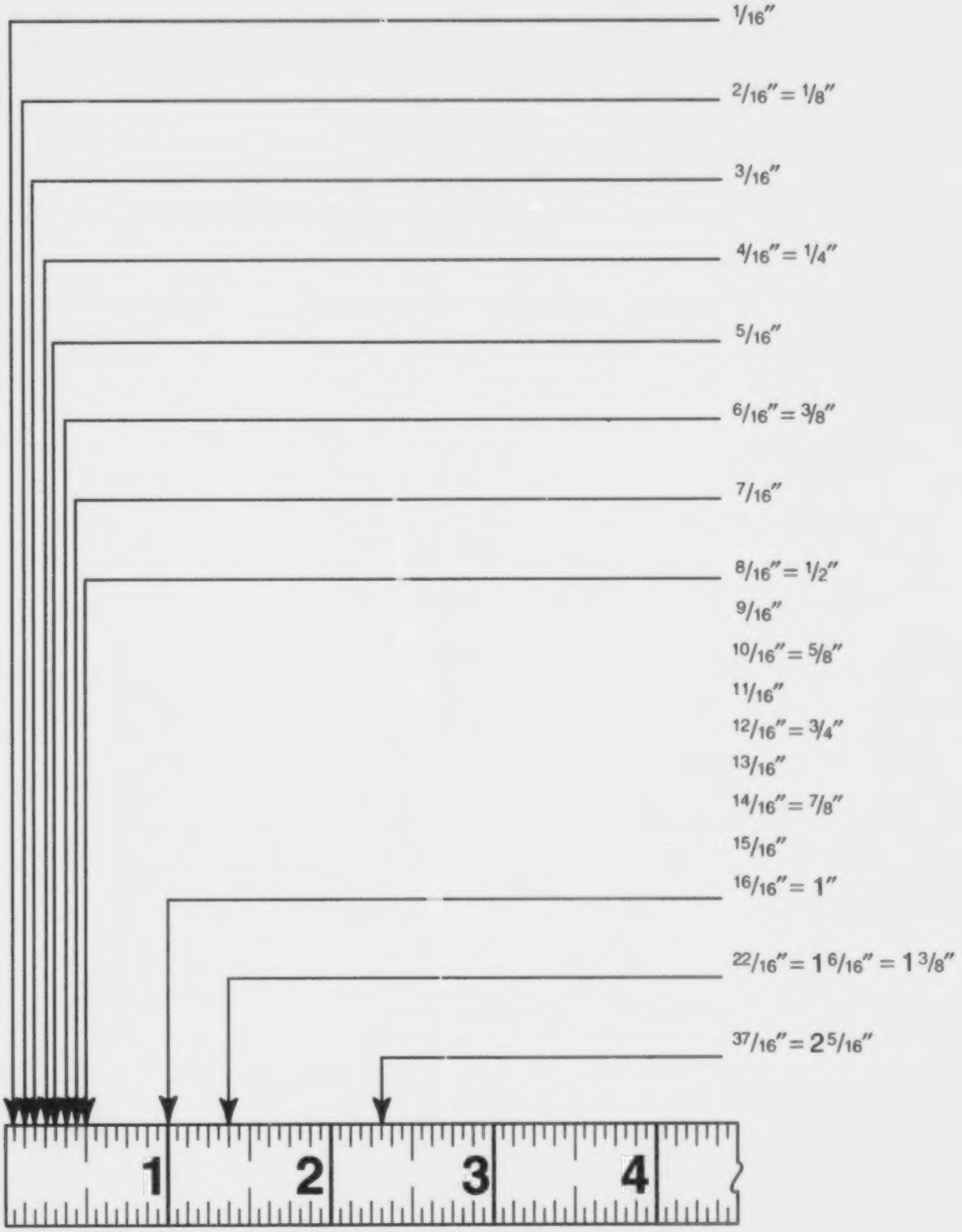
Reading Fourths on a Rule


1/4"
2/4" = 1/2"
3/4"
4/4" = 1"
7/4" = 1 3/4"
1
2
3
4

Reading Eighths on a Rule


1/8"
2/8" = 1/4"
3/8"
4/8" = 1/2"
5/8"
6/8" = 3/4"
7/8"
8/8" = 1"
13/8" = 1 5/8"
1
2
3
4

Reading Sixteenths on a Rule


1/16"
2/16" = 1/8"
3/16"
4/16" = 1/4"
5/16"
6/16" = 3/8"
7/16"
8/16" = 1/2"
9/16"
10/16" = 5/8"
11/16"
12/16" = 3/4"
13/16"
14/16" = 7/8"
15/16"
16/16" = 1"
22/16" = 1 6/16" = 1 3/8"
37/16" = 2 5/16"
1
2
3
4

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 4–3

Answers to Assignment Sheets 4–7

Written Test 4–9

Answers to Written Test 4–15

Learning Activities Sheet 4–17

Transparency Masters

- 1—Production Flow Chart 4–19
- 2—Sample Job Tickets 4–21
- 3—Sample Job Tickets (continued) 4–23

Student Components

Student Page

Objective Sheet 4–3

Information Sheet 4–5

Student Supplement

- 1—Traditional Printing vs. Digital Printing 4–13

Assignment Sheets

- 1—Make an Organizational Chart of the School Print Shop 4–15
- 2—Draw a Floor Plan Locating Production Areas in the School Print Shop 4–17
- 3—Compare Job Tickets for Similarities and Differences 4–19
- 4—Read and Comprehend Information on a Job Ticket 4–21

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

Teaching Suggestions

- Discuss the chain of command for your school.
- Invite a panel of managers from different types of printing firms to talk about chains of command so that students may see different organizational structures.
- Take a field trip to a printing plant to show how extensively computers are used in job control and production.
- Obtain samples of organizational manuals, policies and procedures, and job descriptions from local printing employers. Share these with students, it will give them realistic expectations about the jobs available in your area.
- Collect samples of job tickets from local print shops for students to use with Assignment Sheet 3.
- Discuss with students how technology is changing the way print shops operate. Explain that many of the traditional tasks such as paste-up, process camera photography, and image assembly (stripping) are being replaced by electronic prepress software.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Suggested Activities

Resources Used in Developing This Unit

Print Media

- Dennis, Ervin A. *Lithographic Technology in Transition.* Albany, NY: Delmar Publishers, 1997.
- Dennis, Ervin A., and John D. Jenkins. *Comprehensive Graphic Arts*, 3d ed. Peoria, IL: Glencoe/McGraw-Hill, 1999.
- Prust, Z.A. *Graphic Communications The Printed Image.* Tinley Park, IL: The Goodheart-Willcox Company, Inc., 1999.
- Romano, Frank J., and Richard M. Romano. *The GATF Encyclopedia of Graphic Communications.* Sewickley, PA: GATF Press, 1998.

Suggested Supplemental Resources

Print Media

- Merit, Don. *Production Management in the Graphic Arts.* Sewickley,PA: GATFPress.—This book covers every aspect of the production process within a printing plant, from the roles of specific positions to cutting costs and errors. Item No. 00P044706

  Available from:

  Graphic Arts Technical Foundation
  200 Deer Run Road
  Sewickley, PA 15143-2600
  Toll-free: 1-800-662-3916
  www.gatf.org

Electronic Media

- *Buying Printing.* This live action video takes the viewer through a full line print shop showing everything from concept, ink and paper, photography, stripping, blueline, press quality control, and bindery. 31 minutes. Item No. NIM-119-13-V53

  Available from:

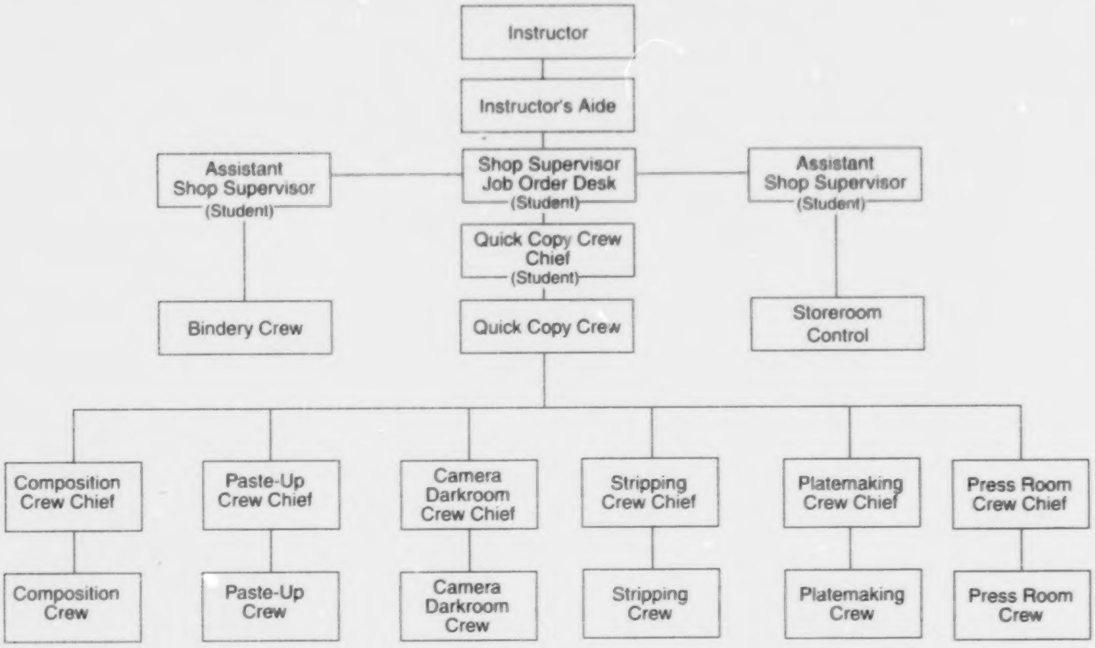
  NIMCO
  P.O. Box 9
  102 Hwy. 81 N.
  Calhoun, KY 42327-0009
  Sales: 1-800-962-6662
  www.nimcoinc.com

Answers to Assignment Sheets

Assignment Sheet 1

Make an Organizational Chart of the School Print Shop

The answer should resemble the schematic below and meet the satisfaction of the instructor.


Instructor
Instructor's Aide
Assistant Shop Supervisor (Student)
Shop Supervisor Job Order Desk (Student)
Assistant Shop Supervisor (Student)
Quick Copy Crew Chief (Student)
Bindery Crew
Quick Copy Crew
Storeroom Control
Composition Crew Chief
Paste-Up Crew Chief
Camera Darkroom Crew Chief
Stripping Crew Chief
Platemaking Crew Chief
Press Room Crew Chief
Composition Crew
Paste-Up Crew
Camera Darkroom Crew
Stripping Crew
Platemaking Crew
Press Room Crew

Assignment Sheet 2

Draw a Floor Plan Locating Production Areas in the School Print Shop

The student should accurately place the production areas of the print shop on a floor plan and correctly indicate production flow. Suggested changes in the layout of the shop should be substantiated with valid reasons.

Assignment Sheet 3

Compare Job Tickets for Similarities and Differences

The student should correctly list the components found on all three of their sample job tickets, correctly list the unique aspects of each job ticket, and explain why they chose the job ticket they did as the most complete and concise.

BEST COPY AVAILABLE

Answers to Assignment Sheets

Assignment Sheet 4

Read and Comprehend Information on a Job Ticket

1. WNCO Radio
2. 145 Main Street, Stillwater, OK 74074
3. 20M circulars, 8 1/2 x 11, 3 color, 1 side
4. Set entire job for 3-color printing and create mechanicals
5. 3 lineshot negatives and 1 halftone negative
6. 3 Color Keys
7. White Warren Lustro Gloss book, 8 1/2 x 11, xpedx, long grain, 80#
8. Ryobi 3200
9. 20,000
10. No
11. Shrink—250's; Box—1,000's; Skids—1/2
12. Shipping Express
13. WNCO Radio, 100 Warehouse Way, Stillwater, OK 74074
14. Longhorn Advertising, 1234 Broadway, Dover, OK 73734

Written Test

Name ______________________________

Date ______________________ Score __________

Objective 1

Name five major concerns of successful printing plant management.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

Objective 2

Complete the following statements concerning strategies a manager can use to operate a graphic arts business by placing the words below in the correct blanks.

Chain of command
Communication
Information
Manuals
Policies
Tasks

a. Use organization ______________ to tell about the firm.

b. Provide organizational charts that show the ______________ and where people fit into the firm.

c. Set ______________ and rules to convey what employees can and cannot do.

d. Provide job descriptions to define workers' ______________.

e. Allow for two-way ______________ in which the manager talks to employees and employees may talk to the manager.

f. Use computer recordkeeping systems that permit quick retrieval of ______________ about current and completed printing jobs.

Written Test

Objective 3

Match the job titles with the descriptions of job duties. Descriptions continue on the next page.

1. Artists
2. Billing personnel
3. Bindery personnel
4. Camera operators
5. Copywriters
6. Design personnel
7. Electronic prepress personnel
8. Estimator
9. Feeder and helper
10. Filing personnel
11. Manager
12. Mark-up personnel
13. Paste-up personnel
14. Photographer
15. Platemakers
16. Press operators
17. Proofreaders
18. Sales and customer service representative
19. Shipping personnel
20. Strippers
21. Typesetters

______ a. Organizes and supervises production in the shop or plant

______ b. Initiate job orders and maintain good customer relations during and after the job

______ c. Estimates the total cost of a printing job

______ d. Write the copy for printing jobs

______ e. Plan and arrange type and visual elements for the printing job

______ f. Provides photographs and special photographic illustrations for jobs

______ g. Provide special art and illustrations for printing jobs

______ h. Copyfit and mark the type, style, and size designations for printing jobs

______ i. Compose or set type according to mark-up specifications

______ j. Assemble elements of a layout for reproduction

______ k. Read the proofs at various stages of production to make sure there are no mistakes

______ l. Provide the film negative of the printing job

______ m. Tape the negatives in their proper place on the printing mask or flat

______ n. Expose the plate and develop it so it is ready for the press

______ o. Prepare press for operation and run the finished plate on the press

______ p. Help press operator load paper table and unload delivery table

_____ q. Prepare materials for output to imagesetters, large-format printers, platesetters, or other PostScript-type devices at a print shop

_____ r. Complete bindery work, such as collating, folding, and stitching

_____ s. Pack, label, ship, or deliver completed jobs

_____ t. File flats and plates in customer job files

_____ u. Make out invoices and bill customers for completed work

Objective 4

Arrange in proper sequence the production steps of a job using traditional printing methods by writing a "1" for the first step, a "2" for the second step, and so on.

Note: Some answers may have two numbers.

_____ a. Presswork

_____ b. Stripping

_____ c. Proofreading

_____ d. Sales and estimate

_____ e. Billing

_____ f. Binding and finishing

_____ g. Quality control

_____ h. Paste-up

_____ i. Typesetting

_____ j. Mark-up

_____ k. Job order

_____ l. Copywriter

_____ m. Prepress proofing

_____ n. Packaging, shipping, and delivery

_____ o. Design

_____ p. Platemaking

_____ q. Proofreading

_____ r. Camera

Written Test

Objective 5

List three items essential to proper job production control.

a. ______________________________

b. ______________________________

c. ______________________________

Objective 6

Select true statements concerning quality control by placing an "X" in the appropriate blanks.

_____ a. It is important that press operators understand minimum company standards for quality printing.

_____ b. Press operators should understand how conditions relating to paper and register can affect press performance and quality.

_____ c. When monitoring and controlling printing quality it is important to check the following: register, color, storage and handling of paper, and ink film thickness.

_____ d. Understanding how to record technical data and results is not a part of quality control.

_____ e. Monitor, control, and adjust the printing process to maintain specified requirements on the job ticket, including dot gain, register, trapping, etc.

Objective 7

Match the components of a job ticket with their descriptions. Descriptions continue on the next page.

1. Art/samples
2. Bindery
3. Invoice to
4. Job specifications
5. Mailing
6. Packaging/ship to
7. Paper
8. Prep
9. Press
10. Proofs
11. Type/art
12. Vendors

_____ a. Indicates any material to be supplied or an activity performed by an outside company

_____ b. Includes specifics such as which press the job will be printed on, number of copies, ink colors, and waste allowance

_____ c. Indicates how printing job will be packed such as band, wrap, shrink, box, and skids as well as how printing job will be shipped

_____ d. Includes mailing information such as class, bulk-rate permit, PS labels, UPS shipping number, Fed Ex shipping number, etc.

_____ e. Indicates if the art needs to be returned or not and where the samples of the printing job should be sent

_____ f. Includes color, size, weight, grain direction, finish, brand, supplier, and cutting requirements of paper to be used in the printing job

_____ g. Indicates all finishing activities performed including cutting, folding, drilling, perforation, die cutting, etc.

_____ h. Indicates various actions such as set changes only, set entire job, paste-up, and create mechanicals

_____ i. Includes customer name and address, contact person, billing information, quotation, and other important business information

_____ j. Includes quantity, description, flat size, finish size, and invoice amount of the printing job

_____ k. Checks various stages to verify that the following are available: camera-ready art, one piece of film or a number of negatives, or separations to print a full-color job

_____ l. Indicates the types of proofs requested such as blueline, color key, cromalin proof, or press check

Objective 8

Arrange in proper sequence the steps for initiating a printing job by writing a "1" for the first step, a "2" for the second step, and so on.

_____ a. Enter job in log book or computer program and assign number.

_____ b. Fill out complete job order form.

_____ c. Put folder in proper station of material job flow file.

_____ d. Mark material folder, insert job order and job material.

***Permission to duplicate this test is granted.**

Answers to Written Test

Objective 1

The following may be in any order.
a. Safety
b. Cleanliness
c. Efficiency of operation
d. Quality
e. Profit

Objective 2

a. Manuals
b. Chain-of-command
c. Policies
d. Tasks
e. Communication
f. Information

Objective 3

a. 11
b. 18
c. 8
d. 5
e. 6
f. 14
g. 1
h. 12
i. 21
j. 13
k. 17
l. 4
m. 20
n. 15
o. 16
p. 9
q. 7
r. 2
s. 19
t. 10
u. 2

Objective 4

a. 14
b. 11
c. 7 or 9
d. 1
e. 18
f. 15
g. 16
h. 8
i. 6
j. 5
k. 2
l. 3
m. 12
n. 17
o. 4
p. 13
q. 7 or 9
r. 10

Objective 5

Any three of the following:
a. Job ticket
b. Log book with job numbers and/or computer spreadsheet program
c. Identified job material folder (or envelope)
d. Computer record for tracking job through printing plant

Objective 6

a, b, c, e

Objective 7

a. 12
b. 9
c. 6
d. 5
e. 1
f. 7
g. 2
h. 11
i. 3
j. 4
k. 8
l. 10

Objective 8

a. 2
b. 1
c. 4
d. 3

Prerequisites:
None

Learning Activities Sheet

Student Name ______________________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

☐ 3. **Study** Information Sheet, Objectives 1 through 4, and Student Supplement 1.

Optional

☐ 4. **View** Videotape entitled *Buying Printing.*

☐ 5. **Do** Assignment Sheet 1, "Make an Organizational Chart of the School Print Shop."

☐ 6. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 7. If the evaluation is not satisfactory, repeat step 5.

☐ 7. **Do** Assignment Sheet 2, "Draw a Floor Plan Locating Production Areas of the School Print Shop."

☐ 8. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 9. If the evaluation is not satisfactory, repeat step 7.

☐ 9. **Study** Information Sheet, Objectives 5 through 8.

☐ 10. **Do** Assignment Sheet 3, "Compare Job Tickets for Similarities and Differences."

☐ 11. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 12. If the evaluation is not satisfactory, repeat steps 9 and 10.

Learning Activities Sheet

☐ 12. **Do** Assignment Sheet 4, "Read and Comprehend Information on a Job Ticket."

☐ 13. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 14. If the evaluation is not satisfactory, repeat steps 9 and 12.

☐ 14. **Check** With instructor for any additional assignments to be completed.

☐ 15. **Do** Additional assignments listed below.

____

____

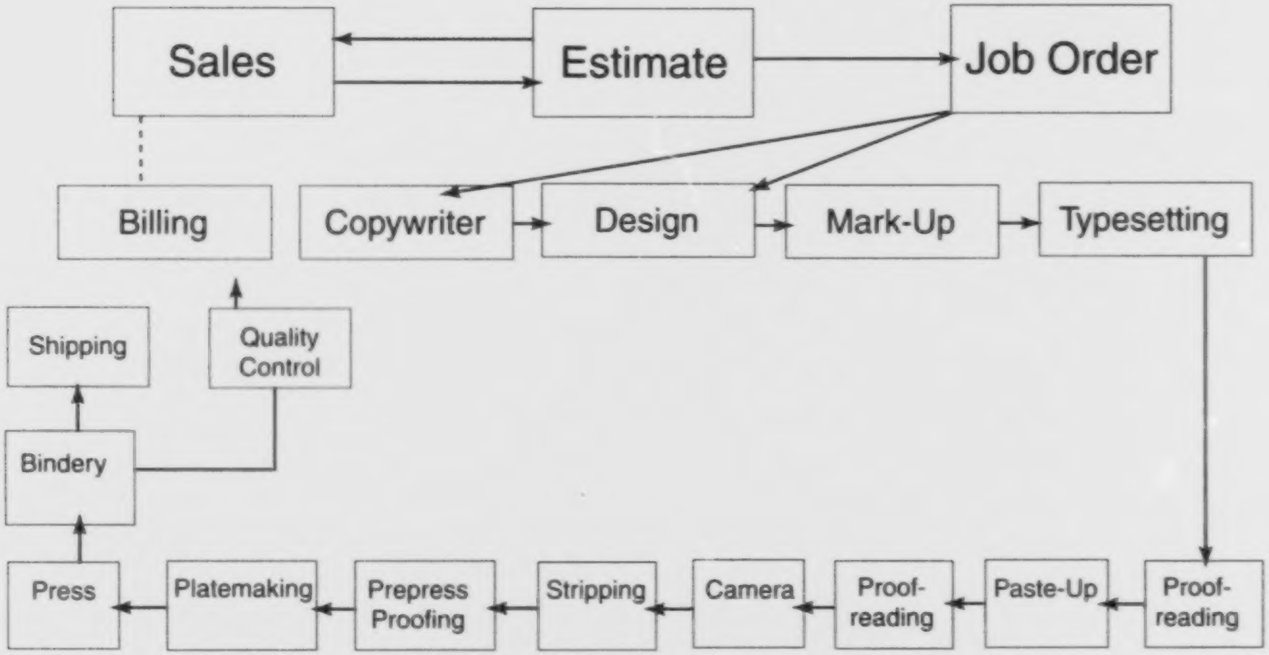
____

☐ 16. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 17. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

***Permission to duplicate this form is granted.**

Production Flow Chart


Sales
Estimate
Job Order
Billing
Copywriter
Design
Mark-Up
Typesetting
Shipping
Quality Control
Bindery
Press
Platemaking
Prepress Proofing
Stripping
Camera
Proof-reading
Paste-Up
Proof-reading

Sample Job Tickets

Job No. **JOB TICKET** **Delivery Date:**

Invoice to:

Customer ______
Address ______
City/State/Zip ______
Contact ______ Phone ______

Date billed ______
Customer No. ______
P.O. # ______
Sales Rep. ______

Date written ______
Written by ______
Date scheduled ______
Materials purchased ______

Job Specs.

Item	Quantity	Description	Flat Size	Finish Size	Invoice Amt.

Type/art

☐ Set changes only ☐ Set entire job
☐ Paste-up ☐ Create mechanicals

______
______
______

Prep

☐ Exact repeat ☐ Change repeat
☐ Camera ready ☐ Film furnished

______
______
______

Proofs ☐ None ☐ ____ Blueline(s) ☐ ____ Color Key(s) ☐ ___Cromalin Proof(s) ☐ _Press Check

Paper

Item	Basis/wgt.	Description	Suppr.	Order In	Due in	No. Sheets	Size/grain	Pieces
							x	
							x	
							x	
							x	
							x	
							x	
							x	

Press

Forms	No. Up	Layout	Press	Front Inks	Back Inks	Gross Sheets	Makeready	Waste Allowance

Bindery

Folding Instructions

______
______
______
______

☐ Saddle stitch on ____ side
☐ Perfect bind on _____ side
☐ Drill _____ holes on _____ side ___ c to s
☐ Trim to size ______
☐ Pad on _____ size _____ sheets/pad
Other:

Vendor

Vendor Name:

Service Provided:

Mailing

Class ______
Permit ______
PS Labels ______
UPS shipper # ______
Fed Ex shipper # ___

Packaging

☐ Band ______
☐ Wrap ______
☐ Shrink ______
☐ Box ______
☐ Skids ______

Ship to

Ship Via:

Shipping Address:
______
______
______

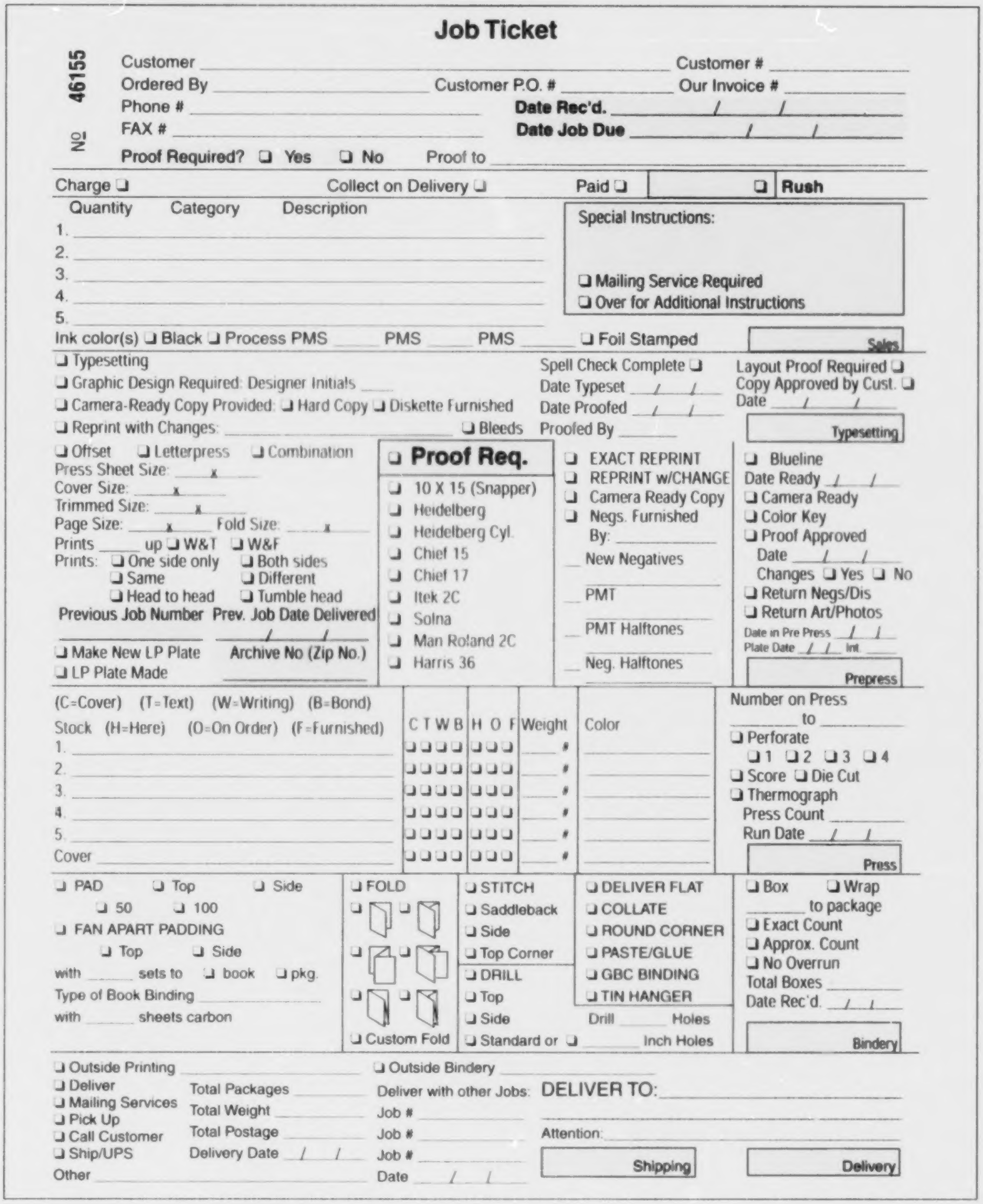
Art/Samples

☐ Do not return art.
☐ Send samples to:

TM 2

BEST COPY AVAILABLE

Sample Job Tickets (continued)



Job Ticket

NO 46155

Customer ____ Customer # ____
Ordered By ____ Customer P.O. # ____ Our Invoice # ____
Phone # ____ **Date Rec'd.** __/__/__
FAX # ____ **Date Job Due** __/__/__
Proof Required? ☐ Yes ☐ No Proof to ____

Charge ☐ Collect on Delivery ☐ Paid ☐ ☐ **Rush**

Quantity Category Description
1. ____
2. ____
3. ____
4. ____
5. ____

Special Instructions:
☐ Mailing Service Required
☐ Over for Additional Instructions

Ink color(s) ☐ Black ☐ Process PMS ____ PMS ____ PMS ____ ☐ Foil Stamped

Sales

☐ Typesetting
☐ Graphic Design Required: Designer Initials ____
☐ Camera-Ready Copy Provided: ☐ Hard Copy ☐ Diskette Furnished
☐ Reprint with Changes: ____ ☐ Bleeds

Spell Check Complete ☐
Date Typeset __/__/__
Date Proofed __/__/__
Proofed By ____

Layout Proof Required ☐
Copy Approved by Cust. ☐
Date __/__/__

Typesetting

☐ Offset ☐ Letterpress ☐ Combination
Press Sheet Size: ____ x ____
Cover Size: ____ x ____
Trimmed Size: ____ x ____
Page Size: ____ x ____ Fold Size: ____ x ____
Prints ____ up ☐ W&T ☐ W&F
Prints: ☐ One side only ☐ Both sides
☐ Same ☐ Different
☐ Head to head ☐ Tumble head
Previous Job Number ____ **Prev. Job Date Delivered** __/__/__
☐ Make New LP Plate **Archive No (Zip No.)** ____
☐ LP Plate Made

☐ **Proof Req.**
☐ 10 X 15 (Snapper)
☐ Heidelberg
☐ Heidelberg Cyl.
☐ Chief 15
☐ Chief 17
☐ Itek 2C
☐ Solna
☐ Man Roland 2C
☐ Harris 36

☐ EXACT REPRINT
☐ REPRINT w/CHANGE
☐ Camera Ready Copy
☐ Negs. Furnished By: ____
__ New Negatives ____
__ PMT ____
__ PMT Halftones ____
__ Neg. Halftones ____

☐ Blueline
Date Ready __/__/__
☐ Camera Ready
☐ Color Key
☐ Proof Approved
Date __/__/__
Changes ☐ Yes ☐ No
☐ Return Negs/Dis
☐ Return Art/Photos
Date in Pre Press __/__/__
Plate Date __/__/__ Int. ____

Prepress

(C=Cover) (T=Text) (W=Writing) (B=Bond)

Stock (H=Here) (O=On Order) (F=Furnished)	C	T	W	B	H	O	F	Weight	Color
1.	☐	☐	☐	☐	☐	☐	☐	#	
2.	☐	☐	☐	☐	☐	☐	☐	#	
3.	☐	☐	☐	☐	☐	☐	☐	#	
4.	☐	☐	☐	☐	☐	☐	☐	#	
5.	☐	☐	☐	☐	☐	☐	☐	#	
Cover	☐	☐	☐	☐	☐	☐	☐	#	

Number on Press ____ to ____
☐ Perforate
☐ 1 ☐ 2 ☐ 3 ☐ 4
☐ Score ☐ Die Cut
☐ Thermograph
Press Count ____
Run Date __/__/__

Press

☐ PAD ☐ Top ☐ Side
☐ 50 ☐ 100
☐ FAN APART PADDING
☐ Top ☐ Side
with ____ sets to ☐ book ☐ pkg.
Type of Book Binding ____
with ____ sheets carbon

☐ FOLD
☐ ☐
☐ ☐
☐ ☐
☐ Custom Fold

☐ STITCH
☐ Saddleback
☐ Side
☐ Top Corner
☐ DRILL
☐ Top
☐ Side Drill ____ Holes
☐ Standard or ☐ ____ Inch Holes

☐ DELIVER FLAT
☐ COLLATE
☐ ROUND CORNER
☐ PASTE/GLUE
☐ GBC BINDING
☐ TIN HANGER

☐ Box ☐ Wrap
____ to package
☐ Exact Count
☐ Approx. Count
☐ No Overrun
Total Boxes ____
Date Rec'd. __/__/__

Bindery

☐ Outside Printing ____ ☐ Outside Bindery ____
☐ Deliver
☐ Mailing Services
☐ Pick Up
☐ Call Customer
☐ Ship/UPS
Other ____

Total Packages ____
Total Weight ____
Total Postage ____
Delivery Date __/__/__

Deliver with other Jobs:
Job # ____
Job # ____
Job # ____
Date __/__/__

DELIVER TO: ____
____
Attention: ____

Shipping

Delivery

Used with permission of Frontier Printers, Inc., Stillwater, OK.

BEST COPY AVAILABLE

Unit 5 Printing Processes

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 5–3

Answers to Assignment Sheets 5–7

Written Test 5–9

Answers to Written Test 5–15

Learning Activities Sheet 5–17

Transparency Masters

1—The Offset Process 5–19
2—Digital Printing Versus Traditional Offset Printing 5–21

Student Components

Student Page

Objective Sheet 5–3

Information Sheet 5–5

Assignment Sheets

1—Write a Summary of an Article on Current Printing Processes 5–17
2—Identify Printing Processes Used to Reproduce Different Printed Pieces 5–19
3—Describe the Offset Printing Process 5–21

Job Sheet

1—Test the Ink-Water Principle on an Offset Plate 5–23

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

- Discuss and demonstrate the job sheet. Make sure all required tools, equipment, and materials are available. Review with students the criteria for evaluation of these activities and the rating scale that will be used to indicate job performance.

Teaching Suggestions

- Tour the school and make a list of printing processes used. Ask students if they think these are the best for the purpose.
- Give a demonstration of printing processes used in your shop.
- Have students find out what types of printing processes are used by printers in your community.
- Arrange a field trip to observe as many processes as possible.
- Obtain wedding invitation sample books. They are great resources for the finishing operations found in Objective 7. Allow students to view and touch the different processes including embossing, foil stamping, and die-cutting.
- Collect samples of the types of material on which printing is done. Display them in the classroom

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Evaluate the job sheet. When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

  Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily completed the process step(s) for each checkpoint area. If the student is unable to complete the procedure correctly, have the student review the materials and try again.

Suggested Activities

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria that are provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Two sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) that best fits your program needs.

Sample A

4—**Skilled**—Can perform job with no additional training.
3—**Moderately skilled**—Has performed job during training program; limited additional training may be required.
2—**Limited skill**—Has performed job during training program; additional training is required to develop skill.
1—**Unskilled**—Is familiar with process, but is unable to perform job.
0—**No exposure**—No information or practice provided during training program.

Sample B

Yes—Can perform job with no additional training.
No—Is unable to perform job satisfactorily.

- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Baird, Russell N. *The Graphics of Communication*. Orlando, FL: Harcourt Brace College Publishers, 1993.
- Dennis, Ervin A., and John D. Jenkins. *Comprehensive Graphic Arts*, 3d ed. Peoria, IL: Glencoe/McGraw-Hill, 1999.
- Destree, Thomas M. *The Lithographers Manual*, 9th ed. Sewickley, PA: GATFPress, 1994.
- *Pocket Pal, A Graphic Arts Production Handbook*. Memphis, TN: International Paper Co., 1997.
- Prust, Z.A. *Graphic Communications The Printed Image*. Tinley Park, IL: The Goodheart-Willcox Company, Inc., 1999.
- Romano, Frank J., and Richard M. Romano. *The GATF Encyclopedia of Graphic Communications*. Sewickley, PA: GATFPress, 1998.

Suggested Activities

Suggested Supplemental Resources

Print Media

- Stevenson, Deborah L. *Handbook of Printing Processes.* Sewickley, PA: GATFPress, 1994.—This introductory text explains and illustrates all the steps of print production for every major printing process. Item No. 1333

Available from:

Graphic Arts Technical Foundation
200 Deer Run Road
Sewickley, PA 15143-2600
Sales: 1-800-662-3916
www.gatf.org

Electronic Media

- *Camera-Ready Copy*—This video explains the relation between mechanicals and negatives and plates. No. NIM-119-14-V49

Available from:

NIMCO
P.O. Box 9
102 Hwy. 81 N.
Calhoun, KY 42327-0009
Sales: 1-800-962-6662
www.nimcoinc.com

Answers to Assignment Sheets

Assignment Sheet 1

Write a Summary of an Article on Current Printing Processes

Summary should include a discussion of the advantages and disadvantages of the printing process researched.

Assignment Sheet 2

Identify Printing Processes Used to Reproduce Different Printed Pieces

Student scrapbook should includes samples of the following:

1. Letterpress—Recognized by a ring of ink around each letter and embossing effect where type pressed into paper
2. Gravure—Recognized by screening over entire image area; type can look fuzzy
3. Offset—Recognized by smooth print, lacking any impression or ring of ink
4. Various specialized processes such as screen printing, engraving, etc.

Assignment Sheet 3

Describe the Offset Printing Process

1. Ink fountain—Continually applies ink to the plate surface
2. Water fountain—Continually applies water to the plate surface
3. Plate cylinder—Rotates to put offset plate in contact with ink, water, and blanket
4. Blanket cylinder—Rotates to put blanket in contact with offset plate and press sheet
5. Impression cylinder—Forces press sheet against blanket to cause the image to be printed on the sheet
6. Offset plate—Carries the right-reading image
7. Blanket—Picks up the mirror or wrong-reading image from the offset plate
8. Press sheet—Receives the right-reading image from the blanket

Written Test

Name ______________________________

Date ______________________ Score __________

Objective 1

Match the terms with their definitions. Definitions continue on the next page.

1. Blanket
2. Blanket cylinder
3. Camera-ready copy
4. Doctor blade
5. Finishing
6. Gravure
7. Image area
8. Impression cylinder
9. Ink fountain
10. Letterpress
11. Makeready
12. Nonimage area
13. Offset
14. Perfecting press
15. Plate
16. Plate cylinder
17. Press sheet
18. Sheet-fed press
19. Water fountain
20. Web-fed press

_____ a. A printing press that takes individual sheets of paper rather than rolls of paper

_____ b. A variety of different operations and specialties performed in line with or after printing

_____ c. The process of printing from a raised surface

_____ d. The cylinder which holds the rubber blanket

_____ e. A press that prints from a roll of paper

_____ f. The cylinder which applies pressure for image transfer to the paper

_____ g. In gravure printing, a knife-edged blade pressed against the etched printing cylinder to wipe away the excess ink from the nonprinting areas

_____ h. A thin sheet of paper, metal, or plastic which carries the image

_____ i. A printing process in which the image is etched below the surface of the printing plate

_____ j. A pasteup ready to be photographed for platemaking

_____ k. In offset printing, a smooth rubber surface which transfers the image from the plate to the paper

_____ l. The process of printing from a flat surface with the image and nonimage areas kept separated by chemistry

_____ m. That part of the plate which repels water and carries the ink to print the image

_____ n. A printing press that prints both sides of the sheet in one pass

_____ o. All the work involved in preparing printing materials for a particular job

_____ p. That part of the offset press that stores and supplies ink to the inking rollers

_____ q. That part of the offset press that stores and supplies water to the dampening rollers

_____ r. That part of the plate which is bathed in water and carries only the background

_____ s. The cylinder which holds the printing plate

_____ t. Receives the right-reading image from the blanket

Objective 2

Select true statements concerning major printing processes by placing an "X" next to the true statements.

_____ a. Offset is the newest but the predominant method used today.

_____ b. Gravure is the oldest printing method.

_____ c. In letterpress printing, the raised image, when inked, is transferred when pressed against paper.

_____ d. In letterpress printing, the entire surface of the plate or cylinder is inked and then wiped clean with a flexible steel scraper called a doctor blade, leaving ink only in the etched areas which the paper "pulls" to form the printed image.

_____ e. In offset printing, both ink and water are applied to the plate during the printing cycle.

_____ f. Offset is recognizable by a smooth print.

Objective 3

Arrange in order the principal prepress steps in offset printing by writing a "1" for the first step, a "2" for the second step, and so on.

_____ a. Plate developed and put on press

_____ b. Negatives stripped into flat

_____ c. Negatives "opaqued" to eliminate undesired spots

_____ d. Page "shot" on negative film with process camera

_____ e. Film developed

_____ f. Original page is created

_____ g. Flat placed over plate and exposed to light

Objective 4

Select true statements concerning the basic offset printing process by placing an "X" next to the true statements.

_____ a. The image area of the plate surface is chemically treated to accept ink and reject water.

_____ b. During the press operation, ink and water are alternately applied to plate surface.

_____ c. The image is wrong-reading on the surface of the offset plate.

_____ d. The image is transferred from the plate to the blanket.

_____ e. The image on the blanket is right-reading.

_____ f. The blanket carries the image to the printing material.

_____ g. The printing takes place as the sheet of paper passes between the blanket cylinder and the impression cylinder.

_____ h. The impression cylinder forces the paper against the blanket causing the image to be printed on the sheet.

_____ i. A clear, clean image is produced by maintaining the proper ink-water balance.

Objective 5

Distinguish among the advantages, disadvantages, and uses of the major printing processes. For each of the following statements, write an "L" for letterpress, a "G" for gravure, or an "O" for offset.

_____ a. High cost of plates and cylinder makes short runs uneconomical.

_____ b. Used for jobs requiring numbering and on-press die cutting, perforating, and embossing.

_____ c. Proofing is relatively inexpensive and available at any stage.

_____ d. Printing plates are relatively inexpensive and require only a short time to make.

_____ e. Used for luxurious large-format art and photo books.

_____ f. Makeready on presses is time consuming.

_____ g. Lends itself to photographic methods; can reproduce anything that can be photographed.

_____ h. Color variations occur due to problems with ink-water balance.

_____ i. Most economic process for long runs.

_____ j. Produces the richest blacks and widest tonal range of all printing processes.

_____ k. Capable of printing jobs of a variety of sizes in black and white and in color at a relatively low cost.

_____ l. Most versatile method of printing; there is equipment for short, medium, and long runs.

Objective 6

Match the specialized printing processes with their descriptions. Descriptions continue on the next page.

1. Computer-to-plate
2. Computer-to-press
3. Electrostatic duplication
4. Engraving
5. Flexography
6. Ink jet
7. Letterset
8. Mimeograph duplication
9. Screen printing
10. Spirit duplication
11. Thermography

_____ a. A printing method in which the image is transferred to the surface to be printed by means of ink squeezed by a squeegee through a stenciled fabric or metal wire screen stretched over a frame

_____ b. Method of printing by spraying droplets of ink through computer-controlled nozzles

_____ c. Technology that utilizes imaging systems that take fully paginated digital materials and expose this information to plates in platesetters or imagesetters without creating film intermediates

_____ d. A process that starts with copies printed by offset or letterpress with special nondrying inks, and the freshly printed sheets are dusted with resinous powder, then heated, causing the powder to fuse and create a raised surface on the print

_____ e. A relief printing method using wrap-around rubber or soft plastic plates and volatile, fast-drying ink

_____ f. Technology that prints images directly on the press from electronic files

_____ g. A printing method in which a low-relief plate is used on a modified offset press. As in conventional offset printing, the ink is transferred from the plate to the paper by being offset from a blanket, but unlike offset printing, no dampening system is required.

_____ h. A copying process produced when static electricity causes a powder to adhere to the charged image area of the copy

_____ i. A direct-plate copying process that employs a typed or handwritten stencil mounted on a cylinder filled with ink which flows through the holes onto the paper

_____ j. A copying process utilizing a paper spirit master with a carbon image transferring the image to paper when the master is moistened by vapors of duplicating fluid

_____ k. Process that reproduces images etched or inscribed into smooth metal

Objective 7

Match the finishing operations with their descriptions.

1. Die-cutting
2. Embossing
3. Foil stamping
4. Numbering
5. Perforating
6. Scoring

_____ a. Applying a thin layer of colored foil to the printed material with a heated stamp or die

_____ b. Punching a line of minute holes in a sheet so that a part may be easily torn away

_____ c. The process of cutting special shapes into printed sheets, sometimes by dies that look and perform much like a cookie cutter

_____ d. Creasing paper so it will fold more easily

_____ e. Impressing an image in relief to achieve a raised surface, either over printing or on blank paper

_____ f. Printing consecutive numbers on invoices, tickets, etc., with a numbering machine

Objective 8

Name six types of material on which printing is done.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

Objective 9

Name the two methods of feeding paper into the press.

a. ______________________________

b. ______________________________

*Permission to duplicate this test is granted.

Answers to Written Test

Objective 1

a. 18
b. 5
c. 10
d. 2
e. 20
f. 8
g. 4
h. 15
i. 6
j. 3
k. 1
l. 13
m. 7
n. 14
o. 11
p. 9
q. 19
r. 12
s. 16
t. 17

Objective 2

a, c, e, f

Objective 3

a. 7
b. 5
c. 4
d. 2
e. 3
f. 1
g. 6

Objective 4

a, d, f, g, h, i

Objective 5

a. G
b. L
c. L
d. O
e. G
f. L
g. O
h. O
i. G
j. G
k. O
l. L

Objective 6

a. 9
b. 6
c. 1
d. 11
e. 5
f. 2
g. 7
h. 3
i. 8
j. 10
k. 4

Objective 7

a. 3
b. 5
c. 1
d. 6
e. 2
f. 4

Objective 8

Any six of the following:
a. Paper
b. Wood
c. Glass
d. Cloth
e. Metal
f. Rubber
g. Plastic
h. Leather

Objective 9

In either order:
a. Sheet feeding
b. Web feeding

Prerequisites:
None

Learning Activities Sheet

Student Name ____________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

☐ 3. **Study** Information Sheet, Objectives 1 through 4.

Optional

☐ 4. **View** Videotape entitled *Camera-Ready Copy.*

☐ 5. **Do** Assignment Sheet 1, "Write a Summary of an Article on Current Printing Processes."

☐ 6. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 7. If the evaluation is not satisfactory, repeat step 5.

☐ 7. **Study** Information Sheet, Objectives 5 through 9.

☐ 8. **Do** Assignment Sheet 2, "Identify Printing Processes Used to Reproduce Different Printed Pieces."

☐ 9. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 10. If the evaluation is not satisfactory, repeat step 8.

☐ 10. **Research** Online resources regarding printing processes. Visit www.heidelbergusa.com as one of your sources.

☐ 11. **Do** Assignment Sheet 3, "Describe the Offset Printing Process."

☐ 12. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 13. If the evaluation is not satisfactory, repeat step 11.

Learning Activities Sheet

☐ 13. **Observe** Demonstration of procedures to be used in completing Job Sheet 1.

☐ 14. **Do** Job Sheet 1, "Test the Ink-Water Principle on an Offset Plate."

☐ 15. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 16. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 1 and repeat steps 13 and 14.

☐ 16. **Check** With instructor for any additional assignments to be completed.

☐ 17. **Do** Additional assignments listed below.

____

____

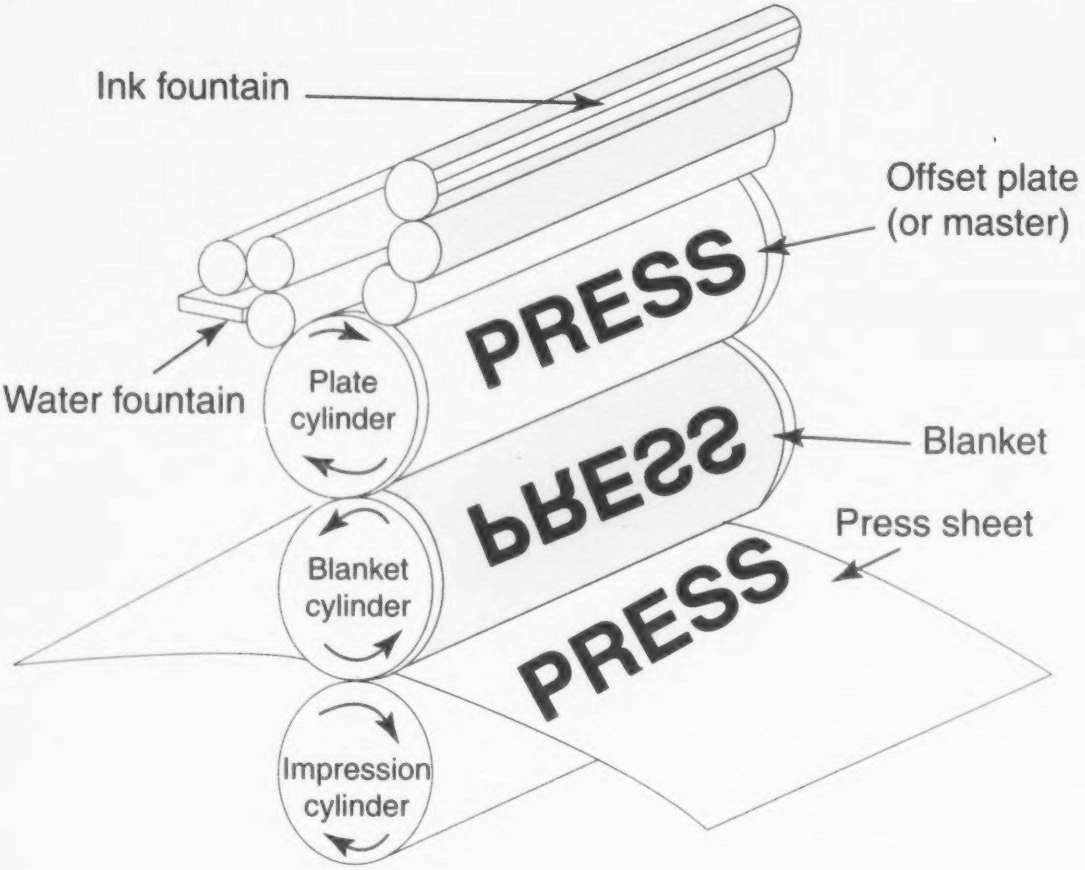
____

☐ 18. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 19. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

***Permission to duplicate this form is granted.**

The Offset Process

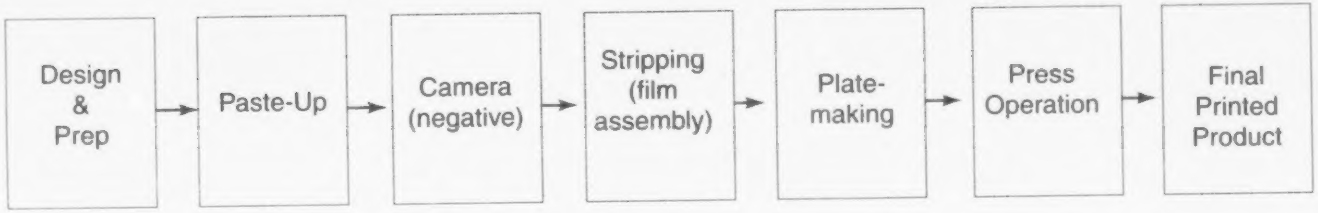

Ink fountain
Offset plate (or master)
PRESS
Water fountain
Plate cylinder
PRESS
Blanket
Press sheet
Blanket cylinder
PRESS
Impression cylinder

Schematic drawing of an offset press. Printing progresses from plate, to blanket, to paper.

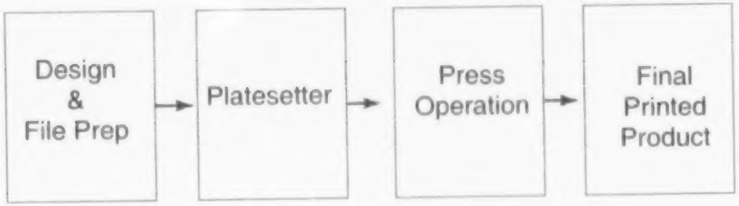
BEST COPY AVAILABLE

Digital Printing Versus Traditional Offset Printing

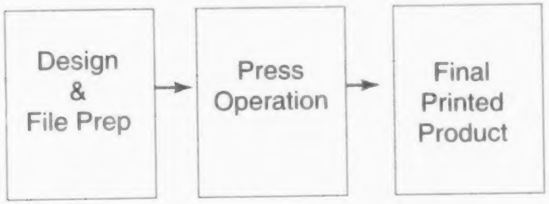
Traditional Offset Printing


Design & Prep → Paste-Up → Camera (negative) → Stripping (film assembly) → Plate-making → Press Operation → Final Printed Product

Computer-to-Plate


Design & File Prep → Platesetter → Press Operation → Final Printed Product

Computer-to-Press


Design & File Prep → Press Operation → Final Printed Product

Unit 6 Paper

Unit Contents

Teacher Page

Teacher Components

Suggested Activities 6–3

Answers to Assignment Sheets 6–7

Written Test 6–9

Answers to Written Test 6–15

Learning Activities Sheet 6–17

Transparency Masters

- 1—Basis Weight of Standard Paper Sizes 6–19
- 2—Caliper of Paper 6–21
- 3—Grain Tests 6–23
- 4—Types of Envelopes 6–25

Student Page

Student Components

Objective Sheet 6–3

Information Sheet 6–5

Assignment Sheets

- 1—Identify Basic Grades of Paper 6–13
- 2—Choose the Correct Paper for Various Jobs 6–15
- 3—Select and Order Paper Utilizing a Paper Cabinet and Paper Price Book 6–17

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

Teaching Suggestions

- Collect samples of the basic grades of paper to show to the class. Discuss characteristics of each grade.
- Invite a paper salesperson to talk to the class about selecting, ordering, and determining the cost of paper.
- Have students obtain examples of letterheads from different businesses and then look to see which ones have watermarks.
- Prepare a display of different types of envelopes to show to the class when discussing Objective 8.
- Obtain a paper price book and paper cabinet for students to use in Assignment Sheet 3.
- Collect samples of letterhead, business cards, invitations, direct mail pieces, circulars, sales brochures, and newsletters. Discuss the type of paper each is printed on.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Beach, Mark, and Eric Kenly. *Getting It Printed.* Cincinnati, OH: North Light Books, 1999.
- Dennis, Ervin A. *Lithographic Technology in Transition.* Albany, NY: Delmar Publishers, 1997.
- *Pocket Pal, A Graphic Arts Production Handbook.* Memphis, TN: International Paper Co., 1997.

Suggested Supplemental Resources

Print Media

- Wilson, Lawrence A. *What the Printer Should Know About Paper*, 3d ed. Sewickley, PA: GATFPress, 1998.—This book covers everything you ever wanted to know about paper including troubleshooting techniques, storing paper, protecting paper, paper manufacturing process, paper grades, etc. Item No. 13083

  Available from:

  Graphic Arts Technical Foundation
  200 Deer Run Road
  Sewickley, PA 15143-2600
  Sales: 1-800-662-3916
  www.gatf.org

Electronic Media

- Internet Resources
  - xpedx—http://www.xpedx.com
    This website is home to the first online paper specialist called Professor Paper. This site is designed to provide answers to all your questions about paper, printing and other related topics. The xpedx site also contains a glossary of paper-related terms.
  - The Mead Corporation—http://www.mead.com/facts/howmade.cfm
    This site contains facts about paper such as information on how paper is made and the history of paper.
  - International Paper—http://www.internationalpaper.com
    This website contains information on the paper recycling process, how paper is made, and how you can make paper, as well as a glossary of paper-related terms. Links to the various paper companies affiliated with International Paper are also listed.
  - PaperCatalog.com—http://www.papercatalog.com
    This website contains information on printing paper for printers and graphic artists. How to buy paper is covered in the following sections: classification of papers, customs and industry practices, formulas, weights and measures.

Suggested Activities

- Videos
  - *Papers for Printing*. This video covers the manufacture of paper, paper properties, paper related printing and bindery problems, ordering and specifying paper and proper paper storage. No. NIM-119-02-V49

    Available from:

    NIMCO
    P.O. Box 9
    102 Hwy. 81 N.
    Calhoun, KY 42327-0009
    Sales: 1-800-962-6662
    www.nimcoinc.com

  - *Paper is Part of the Picture*. The history of paper is outlined in this video.

    Available from:

    Strathmore Papers
    Two Gateway Boulevard
    East Granby, CT 06026
    Customer Service: 1-800-628-8816
    www.strathmore.com

178

Answers to Assignment Sheets

Assignment Sheet 1

Identify Basic Grades of Paper

1. Student scrapbook should include examples of the following grades of paper:
    a. Writing
    b. Book
    c. Cover
    d. Card stock
    e. Newsprint
    f. Specialty paper
2. Students should note the felt side is smoother than the wire side of the papers.
3. Students should note the paper folds more easily with than against the grain.

Assignment Sheet 2

Choose the Correct Paper for Various Jobs

The student's selections should be from the following grades of paper:

1. Writing
2. Cover
3. Cover
4. Specialty paper
5. Newsprint
6. Book
7. Book

Assignment Sheet 3

Select and Order Paper Utilizing a Paper Cabinet and Paper Price Book

Students should have selected appropriate paper for each of the five jobs. Students should also have utilized paper price book to complete purchase order with proper specifications.

Written Test

Name ______________________________

Date ______________________ Score __________

Objective 1

Match the terms with their definitions. Definitions continue on the next page.

1. Basic size
2. Basis weight
3. Brightness
4. Bulk
5. Calendaring
6. Caliper
7. Color
8. Felt side
9. Fiber
10. Finish
11. Grain
12. Opacity
13. Printability
14. Ream
15. Recycled
16. Runability
17. Watermark
18. Wire side

_____ a. Distinctive design created in paper during manufacture

_____ b. Characteristic of paper referring to how much light it reflects

_____ c. The direction the fiber runs in paper

_____ d. Properties that affect the ability of the paper to run on the press

_____ e. Thickness of a sheet of paper, usually measured in thousandths of an inch

_____ f. The ability of a paper to take print adequately without problems

_____ g. Wood pulp reduced to wood or cellulose fibers, the basic ingredient of paper

_____ h. The property of paper that helps prevent printing on one side from showing on the other

_____ i. 500 sheets of paper

_____ j. Surface characteristics of paper that affects look, feel, and printability

_____ k. Thickness of paper, expressed in sheets per inch

_____ l. The smoother side of the paper that was on the felt blanket of the papermaking machine

_____ m. Paper produced from collected waste paper

_____ n. The side of paper next to the screen on the papermaking machine

Written Test

_____ o. The size adopted over time as standard for each type or grade of paper

_____ p. The weight in pounds of 500 sheets of paper cut to a given standard size for the grade

_____ q. A rolling operation during papermaking that creates the amount of smoothness in paper

_____ r. Pigment or shade of paper

Objective 2

Match the basic paper grades with their uses.

1. Book
2. Card stock
3. Cover
4. Newsprint
5. Specialty
6. Writing

_____ a. Used for newspapers, flyers, circulars

_____ b. Used for letterheads, business forms, certificates, checks, flyers, resumes, photocopies

_____ c. Used for books, booklets, brochures, magazines, newsletters, flyers, posters, programs, announcements

_____ d. Used for covers on booklets, business cards, menus, folders, table tents, tickets, invitations, business reply cards

_____ e. Used for file folders, covers, postcards, tags, signs, point of purchase displays

_____ f. Used for directories, direct mail pieces, fly leaves, forms, bags, labels, stickers, banners, maps

Objective 3

Match the basic paper sizes with their dimensions.

1. Bond
2. Book
3. Bristol
4. Cover
5. Index
6. Newsprint
7. Tag

_____ a. 25″ by 38″

_____ b. 22 1/2″ by 35″ and 25 1/2″ by 30 1/2″

_____ c. 24″ by 36″

_____ d. 20″ by 26″

_____ e. 24″ by 36″

_____ f. 17″ by 22″

_____ g. 22 1/2″ by 28 1/2″

Objective 4

Name eight factors affecting paper choice.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

Objective 5

Describe the four tests and procedures for determining grain direction.

a. ____________________

____

b. ____________________

____

c. ____________________

____

d. ____________________

____

Objective 6

Select true statements concerning printing process requirements by placing an "X" next to the true statements.

_____ a. Letterpress papers should be smooth and free from lint and dust.

_____ b. Gravure papers should be rough and have a certain amount of absorbency.

_____ c. Offset papers require moisture resistance and should have good surface strength and be lint-free.

_____ d. Screen printing papers require resistance to change in dimensions under heat drying conditions.

Written Test

Objective 7

List five pieces of information to specify when ordering paper.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

Objective 8

Match commercial envelope number sizes with their dimensions.

1. 6 1/4 size
2. 6 3/4 size
3. 7 size
4. 7 3/4 size
5. Check size
6. Monarch size
7. 9 size
8. 10 size
9. 11 size
10. 12 size
11. 14 size

_____ a. 3 3/4″ x 6 3/4″

_____ b. 4 1/8″ x 9 1/2″

_____ c. 3 5/8″ x 6 1/2″

_____ d. 5″ x 11 1/2″

_____ e. 4 1/2″ x 10 3/8″

_____ f. 3 1/2″ x 6″

_____ g. 3 7/8″ x 7 1/2″

_____ h. 3 5/8″ x 8 5/8″

_____ i. 3 7/8″ x 7 1/2″

_____ j. 4 3/4″ x 11″

_____ k. 3 7/8″ x 8 7/8″

Objective 9

List five rules for handling paper.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

*Permission to duplicate this test is granted.

Answers to Written Test

Objective 1

a. 17
b. 3
c. 11
d. 16
e. 6
f. 13
g. 9
h. 12
i. 14
j. 10
k. 4
l. 8
m. 15
n. 18
o. 1
p. 2
q. 5
r. 7

Objective 2

a. 4
b. 6
c. 1
d. 3
e. 2
f. 5

Objective 3

a. 2
b. 5
c. 6 or 7
d. 4
e. 7 or 6
f. 1
g. 3

Objective 4

Any eight of the following:

a. Grain
b. Weight
c. Size
d. Bulk
e. Opacity
f. Color
g. Finish
h. Price
i. Availability
j. Reproduction quality
k. Durability
l. Chemical and physical properties that affect presswork, folding, and binding
m. Production equipment to be used
n. Suitability for scoring, embossing, die-cutting
o. Psychological factors
p. Postal Service guidelines
q. Mailing costs

Answers to Written Test

Objective 5

a. Bending—Hold a sheet first at one edge, then the other; the side producing the greatest sag is the direction of the grain.
b. Tearing—Tear a sheet from the end and from the side; the cleanest tear is with the grain direction.
c. Folding—Fold and crease paper sharply in both directions; the smoothest crease is with the grain.
d. Wetting—Wet sheet; paper rolls with the direction of grain.

Objective 6

a, c, d

Objective 7

Any five of the following:
a. Quantity
b. Size
c. Grain direction
d. Weight
e. Color
f. Brand name
g. Texture or finish
h. Grade

Objective 8

a. 3
b. 8
c. 2
d. 11
e. 9
f. 1
g. 6 or 4
h. 5
i. 6
j. 6 or 4
k. 7

Objective 9

Any five of the following:
a. Keep paper flat.
b. Never drop paper cartons.
c. Do not store paper in direct sunlight.
d. Stack paper on pallets instead of on concrete floors.
e. Cover pallets (skids) with plastic (skid covers).
f. Cover paper after coming off the press overnight and before it goes to bindery.
g. Reseal opened reams and cartons.
h. Allow incoming paper to adjust to temperature and humidity conditions in the plant.
i. Keep all stock marked; do not destroy paper package labels.
j. Use oldest stock first.
k. Use proper equipment to lift papers.

Prerequisites:
None

Learning Activities Sheet

Student Name ______________________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

☐ 3. **Study** Information Sheet, Objectives 1 through 5.

Optional

☐ 4. **View** Videotape entitled *Papers for Printing.*

☐ 5. **Do** Assignment Sheet 1, "Identify Basic Grades of Paper."

☐ 6. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 7. If the evaluation is not satisfactory, repeat steps 3 and 5.

☐ 7. **Study** Information Sheet, Objectives 6 through 9.

☐ 8. **Do** Assignment Sheet 2, "Choose the Correct Paper for Various Jobs."

☐ 9. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 10. If the evaluation is not satisfactory, repeat steps 7 and 8.

☐ 10. **Research** Online resources regarding paper. Visit http://www.xpedx.com as one of your sources.

☐ 11. **Do** Assignment Sheet 3, "Select and Order Paper Utilizing a Paper Cabinet and Paper Price Book."

☐ 12. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 13. If the evaluation is not satisfactory, repeat step 11.

Learning Activities Sheet

☐ 13. **Check** With instructor for any additional assignments to be completed.

☐ 14. **Do** Additional assignments listed below.

____

____

____

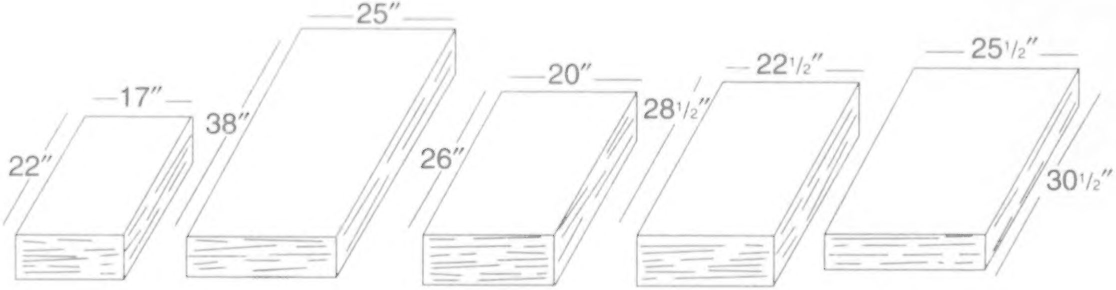
☐ 15. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 16. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

*Permission to duplicate this form is granted.

Basis Weight of Standard Paper Sizes

Basis Weight = Weight of 500 Sheets of Basic Size Paper

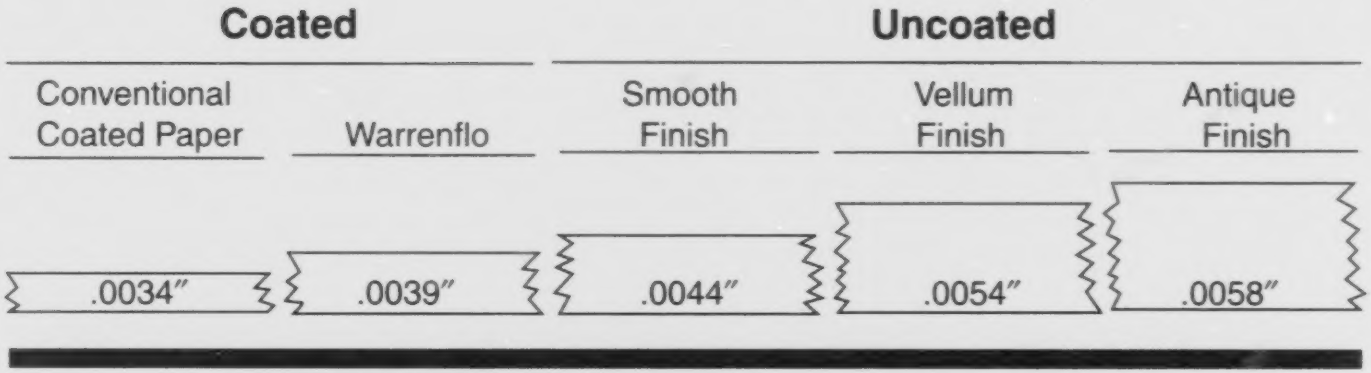


Types of Paper:	Bond	Book-Offset-Text	Cover	Bristol	Index
Basic Size:	17x22	25x38	20x26	22½x28½	25½x30½

Used with permission of Western Paper Company, Oklahoma City, OK.

Caliper of Paper

Enlarged Edge View of Thickness (Caliper)
70 Pound Book Paper

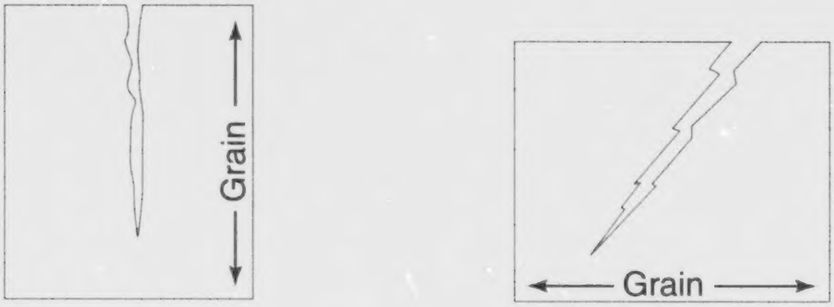

Coated
Uncoated
Conventional Coated Paper
Warrenflo
Smooth Finish
Vellum Finish
Antique Finish
.0034″
.0039″
.0044″
.0054″
.0058″

Small differences in thickness provide significant variation.

Example: Uncoated antique book paper will be 70 percent thicker than conventionally coated offset.

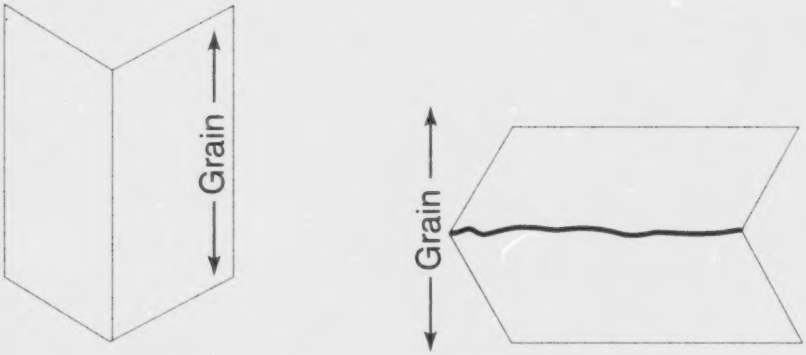
Used with permission of Western Paper Company, Oklahoma City, OK.

Grain Tests


Grain
Grain

Paper tears straighter with grain.

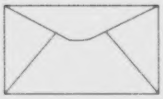
Tear

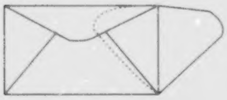

Grain
Grain

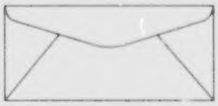
Paper folds more easily with grain.

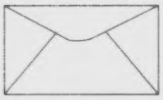
Fold

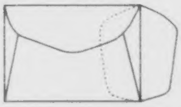
Types of Envelopes

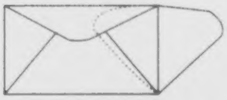

Air Mail

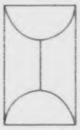

Postage Saver

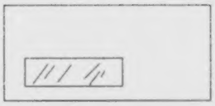

Official

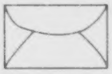

Commercial

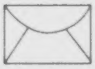

Booklet

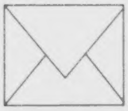

Dot-A-Gum Postage Saver

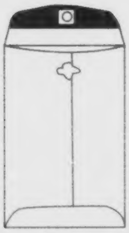

Coin

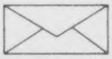

Transparent Window

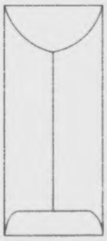

Pay

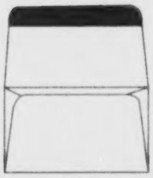

Drug

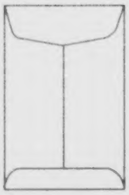

Baronial


Clasp


Theater


Policy


Remittance


Catalog

Courtesy of Carpenter Paper Company, Oklahoma City, OK.

Unit 7

Typography

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 7–3

Answers to Assignment Sheets 7–7

Written Test 7–9

Answers to Written Test 7–13

Learning Activities Sheet 7–15

Transparency Masters

- 1—Parts of a Type Character 7–17
- 2—Classifications of Typefaces 7–19
- 3—Type Sizes 7–21
- 4—Measuring Body Size and Line Depth 7–23

Student Components

Student Page

Objective Sheet 7–3

Information Sheet 7–5

Assignment Sheets

- 1—Identify Typeface Classes in Printed Material 7–17
- 2—Measure Type 7–19
- 3—Identify Formats of Type Composition 7–21

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

Teaching Suggestions

- Show samples of different classifications of typefaces.
- Show samples of different families of type and family variations.
- Show samples of different formats of type composition.

  Note: Collect samples from magazines popular with your students.
- Demonstrate how to use a line gauge.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Baird, Russell N. *The Graphics of Communication*. Orlando, FL: Harcourt Brace College Publishers, 1993.
- Beach, Mark, and Eric Kenly. *Getting It Printed*. Cincinnati, OH: North Light Books, 1999.
- Conover, Theodore E. *Graphic Communications Today*. Albany, NY: Delmar Publishers, 1996.
- Craig, James. *Designing With Type: A Basic Course in Typography*. New York: Watson-Guptill Publications, 1992.

Suggested Supplemental Resources

Print Media

- Williams, Robin. *Beyond the Mac is Not a Typewriter.* Berkeley, CA: Peachpit Press, 1999.—This book provides information on all the typographic principles necessary to create sophisticated and professional typography. It covers issues and techniques that every designer and typographer will want to know, including how to make type more readable and legible, issues regarding punctuation and spacing, and examples of special techniques such as initial caps and swash characters.

  Available from:

  Peachpit Press
  2414 Sixth Street
  Berkeley, CA 94710
  Toll-free: 1-800-283-9444
  www.peachpit.com

Electronic Media

- www.studiomotiv.com/counterspace/—This is an excellent website dedicated to providing information on typography and its history.
- www.cyber-north.com/fonts—This website contains information about the history of typography.
- www.typographic.rsub.com—This website contains a timeline of recent typography, gallery of typographic images, typographic studies, glossary, and suggested materials on type and typography.
- www.itcfonts.com/itc/ulc/index.html—U&lc Online replaces the physically printed version of Upper & Lower Case. It is published by the International Typeface Corporation.

BEST COPY AVAILABLE

Answers to Assignment Sheets

Assignment Sheet 1

Identify Typeface Classes in Printed Material

The student should have several examples for each of the six classifications of typefaces. They should be correctly identified within the limits of information provided. For example, the sans serif category should not have any examples with serifs.

Assignment Sheet 2

Measure Type

1. 15
2. 19
3. 21
4. 11
5. 14
6. 30
7. 12
8. 18
9. 6

Assignment Sheet 3

Identify Formats of Type Composition

Students should have located and correctly labeled at least one example of each of the eight formats.

Written Test

Name ____

Date ________________________________ Score __________

Objective 1

Match the terms with their definitions. Definitions continue on the next page.

1. Ascender
2. Body type
3. Characters
4. Descender
5. Dingbat
6. Display type
7. Family
8. Font
9. Kerning
10. Leading
11. Letterspacing
12. Line gauge
13. Lowercase
14. Measure
15. Pica
16. Point
17. River
18. Serifs
19. Small caps
20. Straight matter
21. Tabular matter
22. Type
23. Typeface
24. Type size
25. Typography
26. Uppercase
27. Widow
28. Wordspacing
29. x-height

_____ a. Printer's ruler that is calibrated in picas, points, and inches

_____ b. Unit of measurement equaling $^1/_6$ of an inch or 12 points

_____ c. Unit of measurement equaling approximately $^1/_{72}$ of an inch or $^1/_{12}$ of a pica; used to express type size or leading

_____ d. The art and science of working with type

_____ e. Characters used singly or collectively to create words, sentences, paragraphs, blocks of copy, etc.

_____ f. A particular style or design of type

_____ g. Individual letters, numerals, punctuation marks or other symbols

_____ h. All the characters of a particular typeface

_____ i. All the typestyles of a particular typeface

_____ j. The height of a typeface measured from the bottom of its descenders to the top of its ascenders

_____ k. Type 12 points and smaller

_____ l. Type 14 points or larger

_____ m. Amount of space between letters

_____ n. Amount of space between words

_____ o. The width of a line of type

Written Test

_____ p. The space between lines of type

_____ q. End of a paragraph or column that is undesirably short

_____ r. Adjusting the letterspacing between certain letters to bring them closer together and create uniformity

_____ s. Short cross-strokes that project out at the end of the main letter strokes in some typefaces

_____ t. The part of a lowercase letter that goes below the x-height, as in g, j, p, q, and y

_____ u. The part of a lowercase letter that rises above the x-height, as in b, d, f,h, k, l, and t

_____ v. The distance between the baseline and mean line of type; the height of a lowercase letter excluding the ascenders or descenders

_____ w. Body type set in normal paragraph form in contrast to tabular matter

_____ x. Charts, tables, formulas, or other elements that make typesetting complicated and time consuming

_____ y. Distracting pattern of white space running vertically down through body copy

_____ z. Capital letters of the alphabet

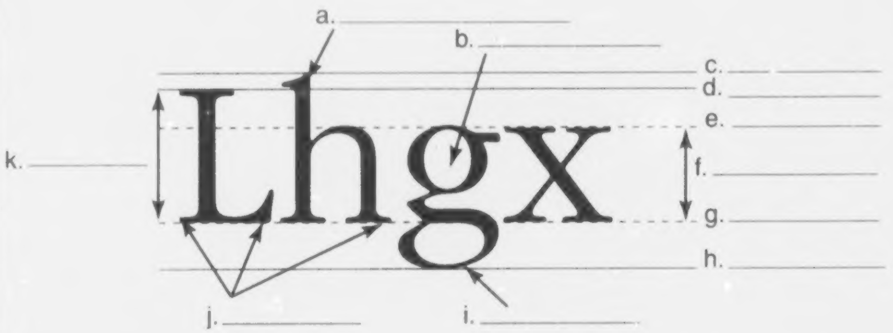
_____ aa. Small letters of the alphabet

_____ bb. Capital letters that are the same size as the x-height of the typeface

_____ cc. A typographic decorative device such as a bullet or star

Objective 2

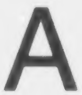
Identify the parts of a type character by writing the correct answers in the blanks in the following illustration.



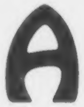
Objective 3

Identify the classifications of typefaces shown by placing the appropriate numbers in the correct blanks.

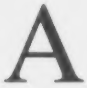
1.



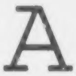
2.



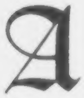
3.



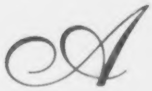
4.



5.



6.



_____ a. Roman

_____ b. Sans serif

_____ c. Script

_____ d. Novelty

_____ e. Square serif

_____ f. Text

Objective 4

Complete the following statements concerning type families by writing the correct word(s) in the blanks.

a. Each classification of typeface consists of subgroups, called __________.

b. ____________________ is ordered by family name.

c. Families have a number of ________________ involving weight, width and posture.

d. Weight variations refer to typestyles designed with ________________ or ________________ strokes.

e. ________________ variations refer to the condensing and extending of the letters.

f. Posture refers to upright and ______________________.

Written Test

Objective 5

Complete the following statements concerning the measurement of type by circling the correct words.

a. The smallest unit of measurement is the (**point, pica**).

b. Points are used to measure (**type size, line length**).

c. 1 pica = (**6, 12, 72**) points.

d. 6 picas = 1 (**point, inch**).

e. Type size is measured (**from bottom of descender to top of ascender, by height of capital letter**).

f. Line length is also known as (**leading, measure**).

g. Leading is measured in (**picas, points**).

h. The amount of spacing between letters is (**wordspacing, letterspacing**).

i. The most common indentation is 1 (**em, en**).

Objective 6

Identify the following formats of type composition by writing the correct names in the blanks.

Sometimes it is necessary to type
copy in different arrangements to
fit the page or space available.
These different arrangements are
called formats.

a. ______________________

THIS IS A SAMPLE OF
HELVETICA, 9 PT., SET IN
UPPERCASE LETTERS

b. ______________________

Now is the time for all good men to
come to the aid of their country. Now is
the time for all good men to come to the
aid of their country. Now is the time for
all good men to come to the aid of their

c. ______________________

The printing industry has been
undergoing unprecedented
change and will continue to do so.
There are two major factors
driving these changes.

d. ______________________

Copy must occasionally be arranged to
fit around a photograph or
illustration. This format has
a name. It is very effective
when used properly, but
should not be overused, or
it will lose its appeal and value.

e. ______________________

***Permission to duplicate this test is granted.**

Answers to Written Test

Objective 1

a. 12
b. 15
c. 16
d. 25
e. 22
f. 23
g. 3
h. 8
i. 7
j. 24
k. 2
l. 6
m. 11
n. 28
o. 14
p. 10
q. 27
r. 9
s. 18
t. 4
u. 1
v. 29
w. 20
x. 21
y. 17
z. 26
aa. 13
bb. 19
cc. 5

Objective 2

a. Ascender
b. Counter
c. Ascender line
d. Cap height
e. Mean line
f. x-height
g. Baseline
h. Descender line
i. Descender
j. Serifs
k. Body

Objective 3

a. 3
b. 1
c. 6
d. 2
e. 4
f. 5

Objective 4

a. Families
b. Type
c. Variations
d. Thinner, thicker
e. Width
f. Italic

Objective 5

a. Point
b. Type size
c. 12
d. Inch
e. From bottom of descender to top of ascender
f. Measure
g. Points
h. Letterspacing
i. Em

BEST COPY AVAILABLE

Answers to Written Test

Objective 6

a. Flush right
b. Centered
c. Justified
d. Flush left
e. Runaround

Prerequisites:
None

Learning Activities Sheet

Student Name ______________________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

☐ 3. **Study** Information Sheet, Objectives 1 through 4.

☐ 4. **Do** Assignment Sheet 1, "Identify Typeface Classes in Printed Material."

☐ 5. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 6. If the evaluation is not satisfactory, repeat steps 3 and 4.

☐ 6. **Research** Online resources regarding typography. Visit www.typographic.rsub.com as one of your sources.

☐ 7. **Study** Information Sheet, Objective 5.

☐ 8. **Do** Assignment Sheet 2, "Measure Type."

☐ 9. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 10. If the evaluation is not satisfactory, repeat steps 7 and 8.

☐ 10. **Study** Information Sheet, Objective 6.

☐ 11. **Do** Assignment Sheet 3, "Identify Formats of Type Composition."

☐ 12. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 13. If the evaluation is not satisfactory, repeat steps 10 and 11.

☐ 13. **Check** With instructor for any additional assignments to be completed.

☐ 14. **Do** Additional assignments listed below.

____

____

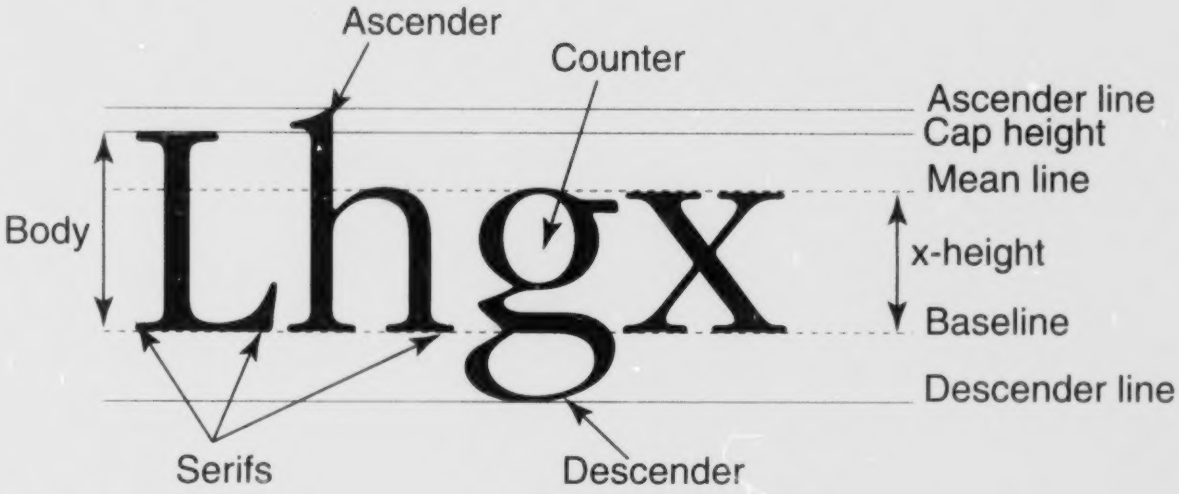
____

☐ 15. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 16. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

***Permission to duplicate this form is granted.**

Parts of a Type Character


Ascender
Counter
Ascender line
Cap height
Mean line
Body
Lhgx
x-height
Baseline
Descender line
Serifs
Descender

209

208

Classifications of Typefaces

Roman or Serif

Times	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Stone Serif	ABCDEFGHIJKLMNOPQRSTUVWXYZ

Square Serif

Courier	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Melior	ABCDEFGHIJKLMNOPQRSTUVWXYZ

Script or Cursive

Shelley Allegro Script
ABCDEFGHIJKLMNOPQRSTUVWXYZ

Nuptial Script	ABCDEFGHIJKLMNOPQRSTUVWXYZ

Sans Serif or Gothic

Avant Garde	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Letter Gothic	ABCDEFGHIJKLMNOPQRSTUVWXYZ
Myriad	ABCDEFGHIJKLMNOPQRSTUVWXYZ

Text

Goudy Text	ABCDEFGHIJKLMNOPQRSTUVWXYZ

Novelty

Hobo	**ABCDEFGHIJKLMNOPQRSTUVWXYZ**
Korinna	ABCDEFGHIJKLMNOPQRSTUVWXYZ
STENCIL	**ABCDEFGHIJKLMNOPQRSTUVWXYZ**

BEST COPY AVAILABLE

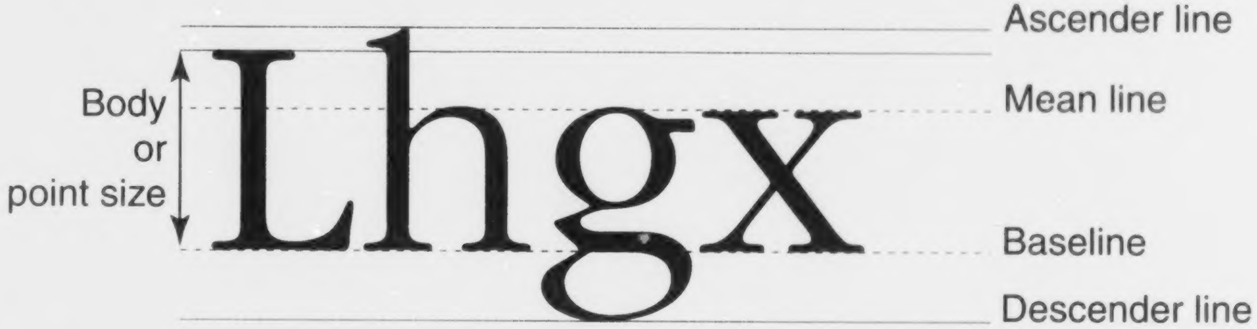
Type Sizes

This is 6 point type.
This is 8 point type.
This is 9 point type.
This is 10 point type.
This is 12 point type.
This is 14 point type.
This is 18 point type.
This is 24 point type.
This is 36 point type.
This is 48 point type.
This is 60 point
This is 72 poin
This is 84 p
This is 96

211

Measuring Body Size and Line Depth

Measure body size from top of ascender to bottom of descender.


Ascender line
Body or point size
Lhgx
Mean line
Baseline
Descender line

Measure line depth from baseline to baseline.

Baseline Measuring and fitting type are not difficult processes, but they
Baseline require knowledge of such terms as point, pica, and leading, } Line depth
Baseline plus some mathematical ability. } Line depth

Unit 8 Typesetting

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 8–3

Answers to Assignment Sheets 8–7

Written Test 8–9

Answers to Written Test 8–13

Learning Activities Sheet 8–15

Transparency Masters

1—Projection Principle of the Photographic Typesetter 8–17
2—Principle of the Digital Typesetter 8–19

Student Components

Student Page

Objective Sheet 8–3

Information Sheet 8–5

Assignment Sheets

1—Calculate Copyfitting 8–13
2—Mark Up Copy 8–15

Job Sheets

1—Set Type Using a Phototypesetting Machine 8–17
2—Set Type Using a Computer 8–19

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

- Discuss and demonstrate the job sheets. Make sure all required tools, equipment, and materials are available. Review with students the criteria for evaluation of these activities and the rating scale that will be used to indicate job performance.

Teaching Suggestions

- Show samples of hand-set type or metal slugs and then compare to transfer type and phototypesetting "fonts."
- Show trade literature on typesetting equipment.
- Show type specimen books.
- Plan a field trip to a "type house" or a newspaper, commercial printer or in-house composing department that uses some of the typesetting equipment referred to in this unit.
- Have students make a survey of the kinds of typesetting equipment used in area shops.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Evaluate the job sheets. When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

  Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily completed the process step(s) for each checkpoint area. If the student is unable to complete the procedure correctly, have the student review the materials and try again.

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria that are provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Two sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) that best fits your program needs.

Sample A

4—**Skilled**—Can perform job with no additional training.
3—**Moderately skilled**—Has performed job during training program; limited additional training may be required.
2—**Limited skill**—Has performed job during training program; additional training is required to develop skill.
1—**Unskilled**—Is familiar with process, but is unable to perform job.
0—**No exposure**—No information or practice provided during training program.

Sample B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Baird, Russell N. *The Graphics of Communication.* Orlando, FL: Harcourt Brace College Publishers, 1993.
- Beach, Mark, and Eric Kenly. *Getting It Printed.* Cincinnati, OH: North Light Books, 1999.
- Craig, James. *Designing With Type: A Basic Course in Typography.* New York: Watson-Guptill Publications, 1992.
- Dennis, Ervin A. *Lithographic Technology in Transition.* Albany, NY: Delmar Publishers, 1997.

Suggested Activities

Suggested Supplemental Resources

Electronic Media

- *Typesetting*. This video covers the following five areas: markup, typesetting, processing, proofreading, and editing. No. NIM-119-15-V53

  Available from:

  NIMCO
  P.O. Box 9
  102 Hwy. 81 N.
  Calhoun, KY 42327-0009
  Sales: 1-800-962-6662
  www.nimcoinc.com

Answers to Assignment Sheets

Assignment Sheet 1

Calculate Copyfitting

1. 16.6 picas
2. 19.5 picas
3. 14.3 picas

Assignment Sheet 2

Mark Up Copy

The student should appropriately mark up the illustrated copy showing text type size and style, width of columns in picas, display type size and style, and leading. The mark-up should be legible and written in margins only.

Written Test

Name ______________________________

Date ______________________ Score __________

Objective 1

Match the terms with their definitions. Definitions continue on the next page.

1. Character count
2. Cold type
3. Compose
4. Composition
5. Compositor
6. Copy
7. Copyfit
8. Cursor
9. Digital type
10. Floppy disk
11. Format
12. Hard copy
13. Hot type
14. H&J
15. In-house composition
16. Keyboard
17. Laser
18. Laser printing
19. Mark up
20. Modem
21. Monitor
22. Mouse
23. OCR
24. Pagination
25. Specifications
26. Type house
27. Type specimen book
28. WYSIWYG

_____ a. Any written material needing to be typeset

_____ b. Type produced by means other than hot metal

_____ c. Type composed by machine from molten metal; sometimes includes hand-set type

_____ d. A business that sets type

_____ e. Typesetting done in the offices of organizations requiring printed materials

_____ f. Book showing examples of all typefaces available from a type shop

_____ g. To set type by any method

_____ h. The individual who sets type

_____ i. Type that has been set

_____ j. Instructions about the typefaces, size, style, leading, measure, arrangement, etc.

_____ k. Hyphenation and justification

_____ l. Indicator that locates on the monitor where the next action will take place

_____ m. Primary computer input device including character keys, numeric keys, direction keys, and other special keys for typographic commands

_____ n. Specifications that the typesetter translates into computer-specific codes to perform rapid setup of type size, style, line width, leading, indents, or a combination of these functions

_____ o. Device to connect one computer to another via telephone lines

_____ p. Small device used to move the cursor on a computer screen

_____ q. Number of characters in a pica, inch, or line; it is different for each typeface and size and varies with extending or condensing

_____ r. To indicate on layout or copy instructions for typesetting

_____ s. To calculate how much space a given amount of copy will occupy when set in a specified size and typeface

_____ t. Abbreviation for "What You See is What You Get"

_____ u. A type of electrostatic printing in which the image is created by modulating a laser on and off according to digital information from a computer

_____ v. A cathode-ray tube keyboard-operated device for displaying copy, making corrections, combining copy elements, and performing other typesetting functions

_____ w. Electronic generation of text and graphics that allows layout and design of multiple pages of a publication to be done on a monitor

_____ x. A scanner that reads typed manuscripts and produces a magnetic or perforated tape or electronic signals from which type can be set

_____ y. A small, flexible plastic disk used to store data magnetically

_____ z. Acronym for Light Amplification by Stimulated Emission of Radiation

_____ aa. Copy on paper as opposed to the "soft" copy in electronic memory

_____ bb. Characters, such as from a laser printer or phototypesetter, made up of thousands of lines or dots positioned by a computer

Written Test

Objective 2

List the two kinds of hot type composition and six kinds of cold type composition.

Hot type

a. ______________________________

b. ______________________________

Cold type

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

Objective 3

Match the composition methods with their advantages or disadvantages.

1. Computer
2. Digitized typesetting
3. Hand lettering
4. Hand-set
5. Machine set
6. Photographic typesetting
7. Strike-on
8. Transfer type

______ a. Coupled with laser printers, puts typesetting into the hands of writers and editors

______ b. Low cost and adequate quality, but limited to text sizes only in small range of typestyles

______ c. Used primarily in custom design work

______ d. High speed, excellent image quality, wide choice of typestyles and sizes, and ability to output both type and graphics

______ e. Slow but popular method of preparing small amounts of distinctive display type; offers the greatest range of typefaces for the least money

______ f. Slow and time-consuming; no longer widely used

______ g. Excellent image quality, wide choice of typestyles, speed, versatility and low cost

______ h. Slow; offers limited choices of typestyles and sizes but still used for premium jobs

Written Test

Objective 4

Select true statements concerning the typesetting process by placing an "X" in the appropriate blanks.

_____ a. Copy may be delivered to the typesetter electronically.

_____ b. Type of paper influences the reproduction quality of type.

_____ c. The amount of keyboarding required is the only factor affecting cost of typesetting.

_____ d. Typesetting is done by independent "type houses," printers, quick-copy shops, publishers of newspapers, magazines and books, and in-house.

Objective 5

Select true statements concerning copyfitting by placing an "X" in the appropriate blanks.

_____ a. To determine the depth of typeset copy, calculate leading plus type point size times number of lines.

_____ b. To determine the total of typewritten characters on an elite typewriter, multiply line length by 10, times the number of lines.

_____ c. In using the vertical line method, one should begin by drawing a vertical line down the typewritten copy at the end of the shortest full line of type.

_____ d. To convert typewriter characters to typesetting, one should determine both type size and type characters per pica.

Objective 6

Select true statements concerning marking up copy by placing an "X" in the appropriate blanks.

_____ a. Mark instructions on the copy, not in the margins.

_____ b. Mark typestyle and size for text and display copy.

_____ c. Mark line measures and leading.

_____ d. After preparing copy, read and correct it with proper proofreading marks.

***Permission to duplicate this test is granted.**

Answers to Written Test

Objective 1

a.	6	h.	5	o.	20	v.	21
b.	2	i.	4	p.	22	w.	24
c.	13	j.	25	q.	1	x.	23
d.	26	k.	14	r.	19	y.	10
e.	15	l.	8	s.	7	z.	17
f.	27	m.	16	t.	28	aa.	12
g.	3	n.	11	u.	18	bb.	9

Objective 2

Hot type (Any order)
a. Hand-set foundry
b. Machine set

Cold type (Any order)
a. Hand lettering
b. Transfer type and press-on lettering
c. Strike-on
d. Photographic typesetting
e. Digitized typesetting
f. Computer

Objective 3

a.	1	e.	8
b.	7	f.	4
c.	3	g.	6
d.	2	h.	5

Objective 4 a, b, d

Objective 5 a, c, d

Objective 6 b, c, d

Prerequisites:
None

Learning Activities Sheet

Student Name ______________________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

Optional 📼

☐ 3. **View** Videotape entitled *Typesetting.*

☐ 4. **Study** Information Sheet, Objectives 1 through 5.

☐ 5. **Do** Assignment Sheet 1, "Calculate Copyfitting."

☐ 6. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 7. If the evaluation is not satisfactory, repeat step 5.

☐ 7. **Study** Information Sheet, Objective 6.

☐ 8. **Do** Assignment Sheet 2, "Mark Up Copy."

☐ 9. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 10. If the evaluation is not satisfactory, repeat steps 7 and 8.

☐ 10. **Observe** Demonstration of procedures to be used in completing Job Sheet 1.

☐ 11. **Do** Job Sheet 1, "Set Type Using a Phototypesetting Machine."

☐ 12. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 13. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 1 and repeat step 11.

Learning Activities Sheet

☐ 13. **Observe** Demonstration of procedures to be used in completing Job Sheet 2.

☐ 14. **Do** Job Sheet 2, “Set Type Using a Computer.”

☐ 15. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 16. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 2 and repeat step 14.

☐ 16. **Check** With instructor for any additional assignments to be completed.

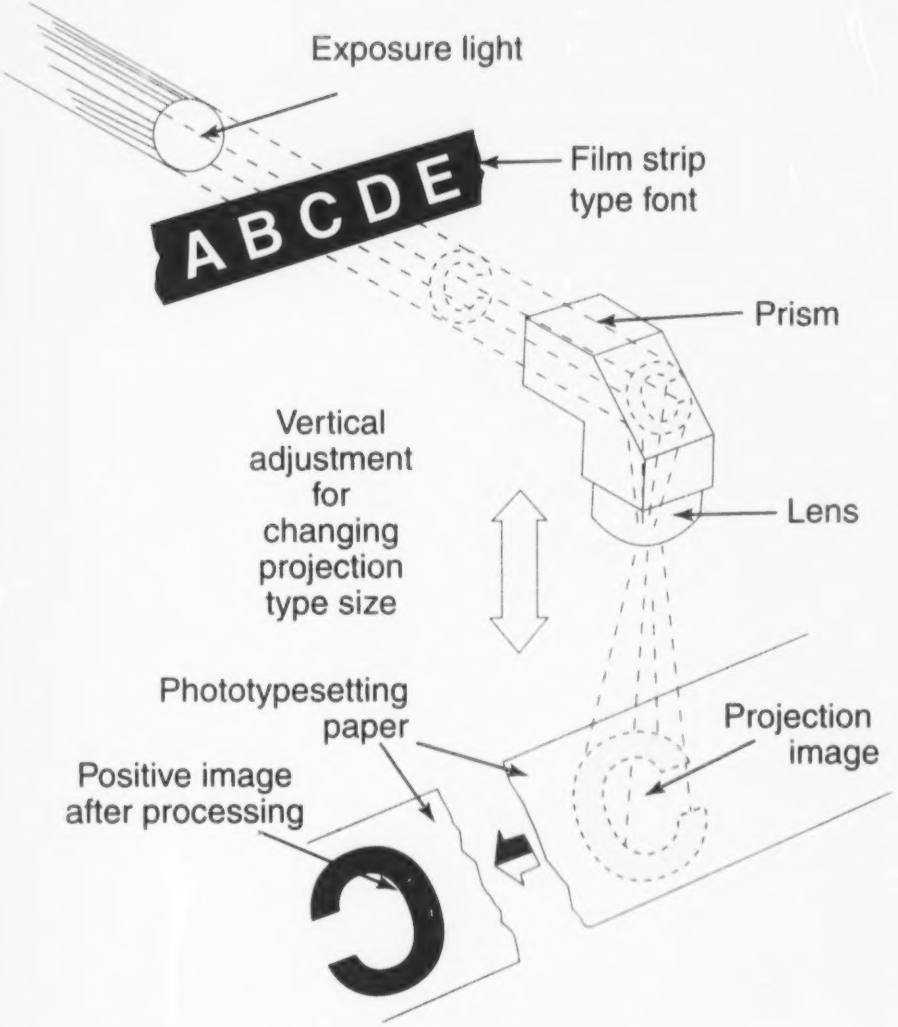
☐ 17. **Do** Additional assignments listed below.

☐ 18. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

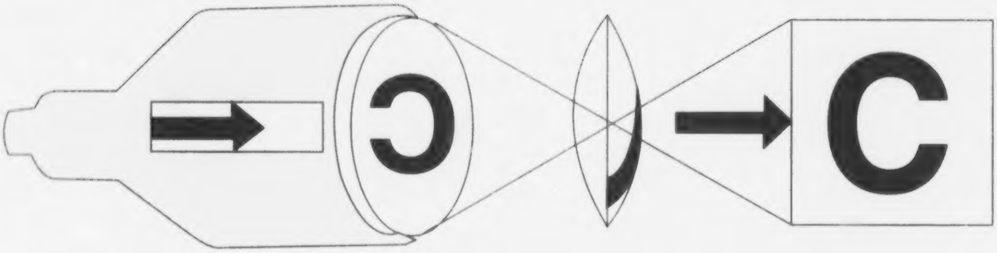
☐ 19. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

***Permission to duplicate this form is granted.**

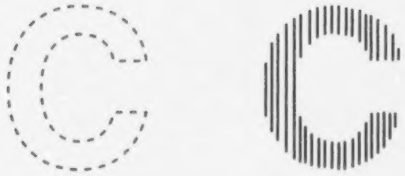
Projection Principle of the Photographic Typesetter


Exposure light
Film strip type font
A B C D E
Prism
Vertical adjustment for changing projection type size
Lens
Phototypesetting paper
Projection image
Positive image after processing

Principle of the Digital Typesetter



The scanner "reads" the character and stores it as an outline.



The outline is then filled in with tiny lines.

Unit 9 Design Principles

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 9–3

Answers to Assignment Sheets 9–7

Written Test 9–9

Answers to Written Test 9–15

Learning Activities Sheet 9–17

Transparency Masters

1—Line Art 9–19
2—Continuous Tone Art 9–21

Student Components

Student Page

Objective Sheet 9–3

Information Sheet 9–5

Assignment Sheets

1—Make Thumbnail and Rough Layouts 9–29
2—Label Magazine Ads That Utilize Principles of Design 9–31
3—Identify Types of Art in Printed Material 9–33
4—Complete a Drawing of the Printer's Color Wheel 9–35
5—Identify Six Basic Color Combinations in Printed Material 9–37

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of these activities.

Suggested Activities

Teaching Suggestions

- Bring to class samples of thumbnail sketches, rough layouts, and comprehensives.
- Plan a visit to a commercial art department or advertising agency to observe design principles being utilized.
- Invite an art director, graphic designer, or art teacher to class to discuss art, color, and principles of design.
- Create some layouts utilizing design principles taught in this unit and discuss with class.
- Show examples of spot and process color used in printed material.
- Bring to class samples of miscellaneous publications.
- Show students an actual color wheel.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheets. Rate the student using the criteria listed on each assignment sheet. See Answers to Assignment Sheets for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Arntson, Amy E. *Graphic Design Basics*. Orlando, FL: Harcourt-Brace College Publications, 2000.
- Baird, Russell N. *The Graphics of Communication*. Orlando, FL: Harcourt-Brace College Publishers, 1993.
- Nelson, Roy Paul. *Publication Design*. Madison, WI: Brown and Benchmark, 1991.

Suggested Supplemental Resources

Print Media

- *Communication Arts*—This magazine is the place to go for design inspiration. Within this magazine you will find design issue columns, freelance columns, technology resources, legal affair columns—not to mention book reviews, Web resources, and production resources.

  Communication Arts
  P.O. Box 10300
  Palo Alto, CA 94303
  Tel: 650-326-6040
  www.commarts.com

- *PRINT Magazine*—*PRINT*s magazine and website feature the latest from the world of graphic design, offering services such as upcoming events and industry contacts. At the center of *PRINT* is their Regional Design Annual, a collection of over 6000 great images culled from the past three editions of *PRINT*s prestigious national design competition.

  PRINT Magazine
  3200 Tower Oaks Blvd.
  Rockville, MD 20852
  Toll-free: 1-800-222-2654
  www.printmag.com

Electronic Media

- Internet Resources
  - http://graphicdesign.miningco.com/arts/graphicdesign/msubclr.htm This website contains numerous links to sites that contain information about color calibration, the color wheel, color and printing, frequently asked color questions, etc.
  - http://www.imation.com/ppsd/color.html—This website explains what color is, how color is perceived, and how color is reproduced. It also addresses the limitations of color reproduction, the importance of viewing conditions, and why and how color is measured.

Suggested Activities

- Videos
  - *Graphic Design I: Demonstrating the Values of Good Design.* This video shows fundamentals of design (organization, contrast, etc.) by following actual studio and agency projects from beginning to end. No. GLV-2040-V49
  - *Graphic Design II: The Application of Good Design*—This video reveals how to create presentations that sell by watching professional designers working on rough layouts, comprehensives, and dummies. No. GLV-2041-V49

The videos listed above are available from:

NIMCO
P.O. Box 9
102 Hwy. 81 N.
Calhoun, KY 42327-0009
Sales: 1-800-962-6662
www.nimcoinc.com

Answers to Assignment Sheets

Assignment Sheet 1

Make Thumbnail and Rough Layouts

The following elements should be present in the advertisement the student selected: headline, art, body copy, and logo.

At least three proportional thumbnails and one rough layout should be submitted following the principles of design outlined in the unit.

Assignment Sheet 2

Label Magazine Ads That Utilize Principles of Design

The student should locate and label at least one advertisement demonstrating each of the following: balance, proportion, sequence, emphasis, and unity.

Assignment Sheet 3

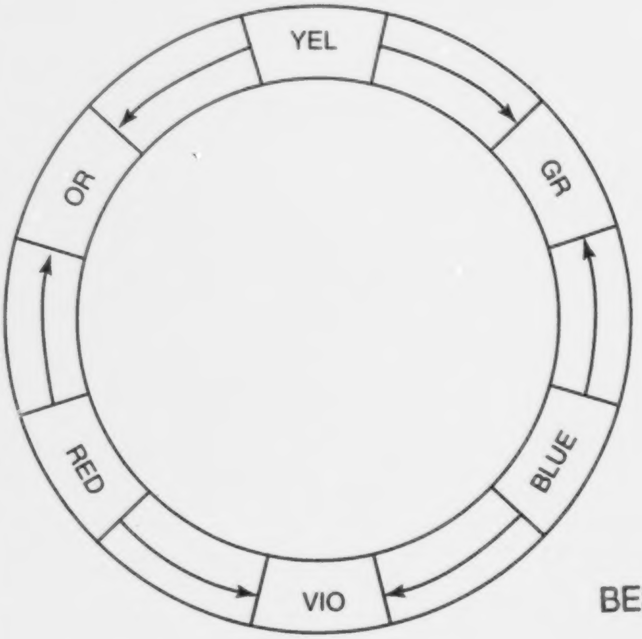
Identify Types of Art in Printed Material

The student should bring at least three examples of line art and three examples of continuous tone art to class for discussion.

Assignment Sheet 4

Complete a Drawing of the Printer's Color Wheel

The completed color wheel should look like the following:



BEST COPY AVAILABLE

Note: You may wish to have the students write in the tertiary colors as well.

Answers to Assignment Sheets

Assignment Sheet 5

Identify Six Basic Color Combinations in Printed Material

The student should locate and identify at least one example of each of the listed basic color combinations.

Written Test

Name ____

Date ______________________________ Score __________

Objective 1

Match the terms with their definitions. Definitions continue on the next page.

1. Align
2. Alley
3. Art
4. Balance
5. Bleed
6. Clip art
7. Color swatch
8. Comprehensive
9. Continuous tone art
10. Copy
11. Design
12. Element
13. Emphasis
14. Four-color process
15. Gutter
16. High contrast
17. Layout
18. Line art
19. Logo
20. Margin
21. Optical center
22. PMS
23. Proportion
24. Rough
25. Rule
26. Screen tint
27. Sequence
28. Thumbnail
29. Unity
30. White space

_____ a. Each individual portion of the printed message

_____ b. Everything that will be printed or reproduced: type, photographs, illustrations, etc.

_____ c. Space not occupied by type, art, or other graphic elements

_____ d. A trademark or unique type of lettering spelling out the name of a company or product

_____ e. Line used for graphic effect

_____ f. Area of image printed with dots so ink coverage is less than 100% and simulates shading or a lighter color

_____ g. The plan and arrangement of graphic elements

_____ h. The preliminary plan or blueprint for any piece to be printed

_____ i. To arrange elements so they line up with other elements

_____ j. Layout that looks almost like the final printed piece will look

_____ k. A small, quickly-drawn sketch that shows a possible way to combine various elements of a proposed printed piece

Written Test

_____ l. Simple sketch showing the size and position of the various elements of the design; usually an actual size, somewhat more refined version of the thumbnail

_____ m. The size relationship of one part of the design to the other parts

_____ n. Arrangement of elements that attracts attention to the most important element

_____ o. Proper placement of elements by weight

_____ p. The overall sense that all elements are related

_____ q. Arrangement of elements to promote eye movement in logical order

_____ r. Space where two pages meet at the binding

_____ s. Space between columns on a page

_____ t. Any image that extends to the edge of a sheet or page after trimming

_____ u. Space that frames the content of a page or sheet

_____ v. Point slightly above and to the left of the mathematical center

_____ w. All pictorial matter: photographs, paintings, drawings, charts and graphs, etc.

_____ x. Photographs, paintings, and other images having a completed range or variation of tones from white to black

_____ y. Any solid image consisting of black lines on white background without gradation of tones

_____ z. High contrast drawings usually on white, slick paper and made to be cut out and pasted into place for the printer

_____ aa. Few or no tonal gradations between dark and light areas

_____ bb. Sample of an ink color

_____ cc. Technique of printing using the four process colors of ink to simulate full color

_____ dd. A widely used method of specifying spot color by means of numbered color samples available in swatchbooks

Objective 2

Match the terms related to color with their definitions.

1. Cool colors
2. Hue
3. Intensity
4. Primary colors
5. Shade
6. Tint
7. Tone
8. Warm colors

_____ a. Restful colors like blue and green that tend to recede from the viewer

_____ b. The full strength or purity of a color

_____ c. Black added to a color to make it darker

_____ d. Distinctive characteristics of a given color that enable it to be recognized by name

_____ e. Stimulating colors like red and orange that tend to project toward the viewer

_____ f. White added to a color to make it lighter

_____ g. The three basic colors—red, yellow, and blue—from which all other color can be produced, at least in theory

_____ h. Range of light values from white to black, bright to dull

Objective 3

Arrange in order the steps in the design process by writing a "1" for the first step, a "2" for the second step, and so on.

_____ a. Find solutions—Think of all the bits of information you have gathered and decide the best way to solve the problem.

_____ b. Define the problem and audience—Decide what is to be communicated and to whom.

_____ c. Refine ideas and present solution—Prepare copy and layout.

_____ d. Gather information—Research the problem by reading, discussing, and thinking about it.

_____ e. Evaluated solutions—Decide on the best possible solution; then reexamine the solution possibilities.

Objective 4

Select from the following list things a designer wants from a printer by placing an "X" in the appropriate blanks.

_____ a. A cheap price, even if some details are neglected

_____ b. Fast answers to queries

_____ c. On time delivery

_____ d. Attention to detail; highest possible quality

Written Test

Objective 5

List three functions of design.

a. ______________________________

b. ______________________________

c. ______________________________

Objective 6

List the five components of printed communication.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

Objective 7

Distinguish among the three stages of layout by writing a "T" for thumbnail, an "R" for rough, or a "C" for comprehensive.

_____ a. Actual size

_____ b. Shows different ways to lay out printed piece

_____ c. Tests whether the idea from the thumbnail stage works on a larger scale

_____ d. Small, quick sketch

_____ e. Serves as guideline for making comprehensive

_____ f. Shown to the client who may have difficulty visualizing job in the rough layout stage

_____ g. Has specifications for printing job written in margin

_____ h. Looks as much like final printed piece as possible

_____ i. Also called the miniature

_____ j. Aids in visualizing spacing, balance, proportion, and emphasis

_____ k. Used to explore and develop an idea

Objective 8

Select true statements concerning principles of design by placing an "X" next to the true statements.

_____ a. When using formal balance, each element that appears on one side of the design also appears on the other side.

_____ b. White space is passive when using informal balance.

_____ c. With informal balance, the design is asymmetrical.

_____ d. Single page margins should make type area appear optically centered.

_____ e. Space within a page should be broken up into pleasing proportions of light to dark and color to noncolor.

_____ f. Equal margins are interesting.

_____ g. The vertical center of a page is the mathematical center.

_____ h. Directional pattern utilizes natural eye movement from big elements to small elements.

_____ i. Emphasis is achieved by use of contrasting typefaces.

_____ j. To achieve emphasis, all elements of a design should have the same shape.

_____ k. To achieve unity, the design should be as elaborate as possible.

_____ l. A layout has unity when the elements appear to be related and held together by a single theme.

Objective 9

List the two basic types of art and three sources for each type.

Type	**Sources**
a. ____________	1) ____________
	2) ____________
	3) ____________

Type	**Sources**
b. ____________	1) ____________
	2) ____________
	3) ____________

Written Test

Objective 10

Select true statements concerning working with color by placing an "X" next to the true statements.

_____ a. Two basic categories of color printing are process color and spot color.

_____ b. The Pantone Matching System is an international printing, publishing, and packaging color language.

_____ c. Secondary colors are orange, brown, and green.

_____ d. By combining primary and secondary colors, intermediate colors can be formed.

_____ e. A combination of any two primary colors results in a third or tertiary color.

_____ f. Two or more tones of one color results in monochromatic harmony.

_____ g. Use of two colors directly opposite from each other on the color wheel results in analogous harmony.

_____ h. When using triad combinations, they should not all be of the same strength or intensity.

_____ i. Black, white, and gray may be used with any color or combination of colors and result in perfect harmony.

_____ j. Warm colors are red and green.

_____ k. When using more than one color, reserve the darkest for the basic message.

_____ l. Type in color, or on colored stock, is strongly recommended.

Objective 11

List five kinds of publication design.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

***Permission to duplicate this test is granted.**

Answers to Written Test

Objective 1

a.	12	i.	1	q.	27	y.	18
b.	10	j.	8	r.	15	z.	6
c.	30	k.	28	s.	2	aa.	16
d.	19	l.	24	t.	5	bb.	7
e.	25	m.	23	u.	20	cc.	14
f.	26	n.	13	v.	21	dd.	22
g.	11	o.	4	w.	3		
h.	17	p.	29	x.	9		

Objective 2

a.	1	e.	8
b.	3	f.	6
c.	5	g.	4
d.	2	h.	7

Objective 3

a.	3
b.	1
c.	5
d.	2
e.	4

Objective 4

b, c, d

Objective 5

Any three of the following:

a. Attract, then hold attention of desired audience
b. Make message easy to read
c. Create a clear, orderly flow of graphic elements
d. Leave some lasting impression
e. Use appropriate technology to deliver the message efficiently and economically

Objective 6

The following may be in any order.

a. Body type
b. Display type
c. Art
d. Other graphic devices
e. White space

Objective 7

a.	R or C	g.	R
b.	T	h.	C
c.	R	i.	T
d.	T	j.	R
e.	R	k.	T
f.	C		

BEST COPY AVAILABLE

Answers to Written Test

Objective 8

a, c, d, e, h, i, l

Objective 9

a. Line art—Any three of the following:
   1) Your own drawings
   2) Artists and illustrators
   3) Clip art
   4) Public domain sources
   5) Drawings from government agencies, trade and professional organizations, businesses, chambers of commerce, etc.

b. Continuous tone art—Any three of the following:
   1) Your own photographs
   2) Professional photographers
   3) Stock photo houses that sell prints for one-time use
   4) Photos from government agencies, trade and professional organizations, businesses, chambers of commerce, etc.

Objective 10

a, b, d, f, h, i, k

Objective 11

The following may be in any order:

a. Books
b. Magazines
c. Newspapers
d. Newsletters
e. Miscellaneous publications

Prerequisites:
None

Learning Activities Sheet

Student Name ____________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

Optional ☐ 3. **View** Video entitled *Graphic Design I: Demonstrating the Values of Good Design.*

☐ 4. **Study** Information Sheet, Objectives 1 through 7.

Optional ☐ 5. **View** Video entitled *Graphic Design II: The Application of Good Design.*

☐ 6. **Do** Assignment Sheet 1, "Make Thumbnail and Rough Layouts."

☐ 7. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 8. If the evaluation is not satisfactory, repeat steps 4 and 6.

☐ 8. **Study** Information Sheet, Objective 8.

☐ 9. **Do** Assignment Sheet 2, "Label Magazine Ads That Utilize Principles of Design."

☐ 10. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 11. If the evaluation is not satisfactory, repeat steps 8 and 9.

☐ 11. **Study** Information Sheet, Objective 9.

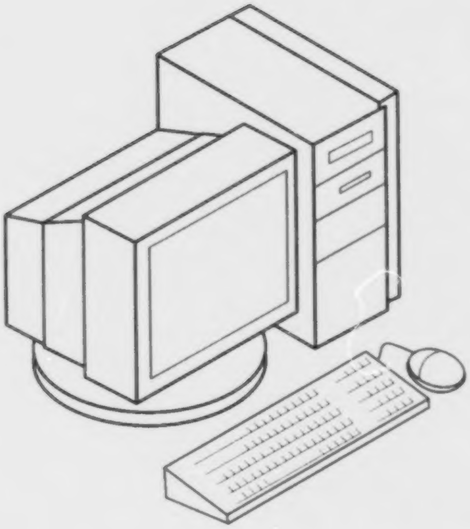
☐ 12. **Do** Assignment Sheet 3, "Identify Types of Art in Printed Material."

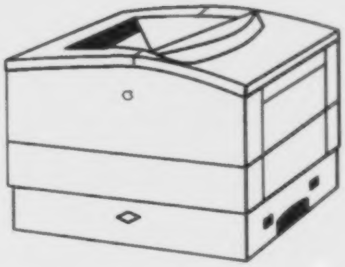
Learning Activities Sheet

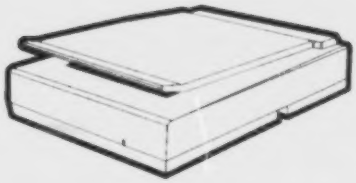
☐ 13.	**Stop**	Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 14. If the evaluation is not satisfactory, repeat steps 11 and 12.
☐ 14.	**Research**	Online resources regarding color. Visit http://www.imation.com/ppsd/color.html.com as one of your sources.
☐ 15.	**Study**	Information Sheet, Objectives 10 and 11.
☐ 16.	**Do**	Assignment Sheet 4, "Complete a Drawing of the Printer's Color Wheel."
☐ 17.	**Stop**	Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 18. If the evaluation is not satisfactory, repeat steps 15 and 16.
☐ 18.	**Do**	Assignment Sheet 5, "Identify Six Basic Color Combinations in Printed Material."
☐ 19.	**Stop**	Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 20. If the evaluation is not satisfactory, repeat step 18.
☐ 20.	**Check**	With instructor for any additional assignments to be completed.
☐ 21.	**Do**	Additional assignments listed below. ____________________ ____________________ ____________________
☐ 22.	**Take**	Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.
☐ 23.	**Stop**	Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

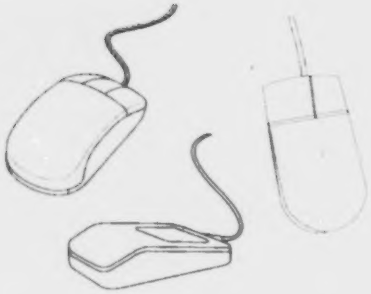
***Permission to duplicate this form is granted.**

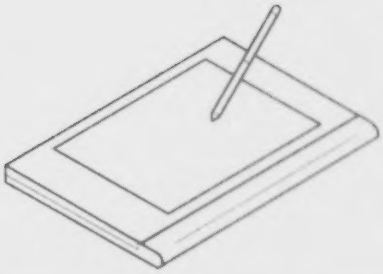
Line Art

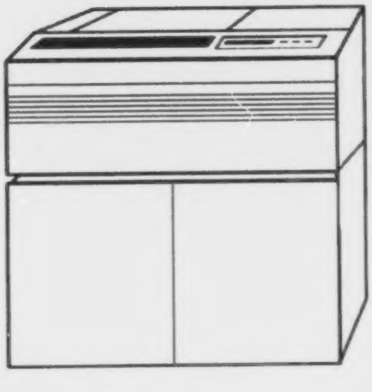


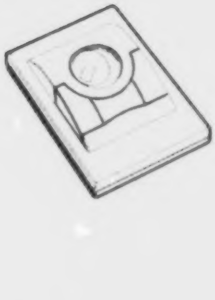




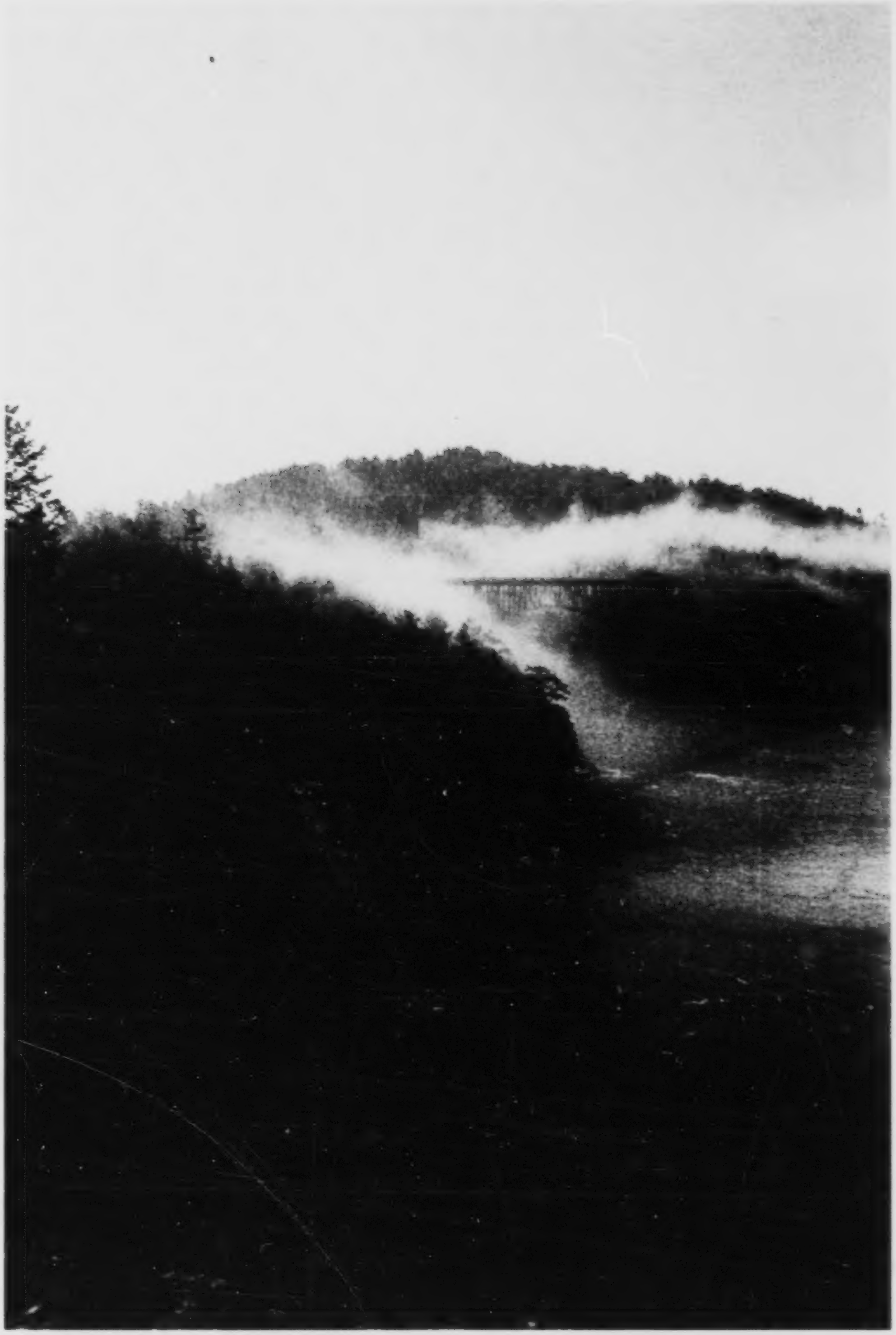








Continuous Tone Art



TM 2

Unit 10 Paste-Up Principles and Procedures

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 10–3

Written Test 10–7

Answers to Written Test 10–15

Learning Activities Sheet 10–17

Student Components

Student Page

Objective Sheet 10–3

Information Sheet 10–5

Job Sheets

1—Prepare a Paste-Up 10–25
2—Prepare Overlays Using Clear Acetate and Ruby Film 10–27
3—Crop a Photograph 10–31
4—Scale Copy 10–33

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss and demonstrate the job sheets. Make sure all required tools, equipment, and materials are available. Review with students the criteria for evaluation of these activities and the rating scale that will be used to indicate job performance.

Suggested Activities

Teaching Suggestions

- Show samples of paste-ups for different kinds of jobs.
- Prepare a display of paste-up tools and materials.
- Make a bulletin board display of tint screens and special effect screens.
- Make a bulletin board display of postal regulations obtained from your Postmaster.
- Provide students with a copy and layout for students to use with Job Sheet 1 and Job Sheet 2.
- Collect photos for students to use with Job Sheet 3.
- Provide students with illustration or halftone copy and dummy or layout for use with Job Sheet 4.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the job sheets. When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

  Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily completed the process step(s) for each checkpoint area. If the student is unable to complete the procedure correctly, have the student review the materials and try again.

  Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria that are provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Suggested Activities

Two sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) that best fits your program needs.

Sample A

4—**Skilled**—Can perform job with no additional training.
3—**Moderately skilled**—Has performed job during training program; limited additional training may be required.
2—**Limited skill**—Has performed job during training program; additional training is required to develop skill.
1—**Unskilled**—Is familiar with process, but is unable to perform job.
0—**No exposure**—No information or practice provided during training program.

Sample B

Yes—Can perform job with no additional training.
No—Is unable to perform job satisfactorily.

- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Baird, Russell N. *The Graphics of Communication*. Orlando, FL: Harcourt-Brace College Publishers, 1993.
- Craig, James. *Production for the Graphic Designer*. New York, NY: Watson-Guptill Publications, 1990.
- *MAX IT!* (Classification Reform). Washington, DC: United States Postal Service, 1996.
- Silver, Gerald A. *Modern Graphic Arts Paste-Up*. Encino, CA: Editorial Enterprises, 1995.

Suggested Supplemental Resources

Print Media

- Destree, Thomas M. *Lithographers Manual*, 9th ed. Sewickley, PA: GATFPress, 1994.—This book covers every aspect of production practice and theory, as well as the entire history and practical aspects of lithography. Item No. 1407

Available from:

Graphic Arts Technical Foundation
200 Deer Run Road
Sewickley, PA 15143-2600
Sales: 1-800-662-3916
www.gatf.org

Suggested Activities

Electronic Media

- *Paste-Up*. This video covers design principles, layouts, selecting paper and ink, cutting waste, paste-up procedures, and proper use of tools. No. NIM-119-08-V53

  Available from:

  NIMCO
  P.O. Box 10
  102 Hwy. 81 N.
  Calhoun, KY 42327-0009
  Sales: 1-800-962-6662
  www.nimcoinc.com

Written Test

Name ____________________

Date ____________________ Score __________

Objective 1

Match the terms with their definitions. Definitions continue on the next page.

1. Acetate
2. Adhesive
3. Base sheet
4. Bleed
5. Camera-ready copy
6. Continuous tone copy
7. Copy
8. Cover sheet
9. Crop
10. Dropout
11. Dummy
12. Flop
13. Folding dummy
14. Ganging
15. Gripper edge
16. Imposition
17. Keyline art
18. Line copy
19. Overlay
20. Paste-up
21. PMT
22. Process camera
23. Proportional scale
24. Reverse
25. Ruby film
26. Scaling
27. Signature
28. Surprint
29. Trailing edge
30. Trim marks
31. Window

_____ a. A detailed diagram instructing paste-up person how to arrange elements of a printing job

_____ b. A set of folded sheets showing the placement of pages and elements within a printed piece; it may be either rough or comprehensive, depending on the client's needs

_____ c. Everything that will be printed: type, art, or other graphic elements

_____ d. Copy which is ready to be photographed for platemaking according to the technical requirements of either quick or commercial printing

_____ e. Art which is prepared for multiple color printing in which the colors overlap slightly

_____ f. Camera-ready assembly of type, art, and other graphic elements pasted on base sheet in exact position and containing instructions, either in the margins or on an overlay, for the printer; also, as verb, to adhere copy to grids or base sheets

_____ g. Right angle marks on paste-up to show the four corners of the printed piece after it has been printed and trimmed

_____ h. Block of masking material on a paste-up that shows position of a photograph or other visual element; a transparent opening in line negatives into which a halftone is stripped

_____ i. Any image that is solid black with no gradation of tones: clip art, type, rules, dots, etc.

_____ j. Any image that has a complete range of tones from black to white: photographs, paintings, drawings, etc.

_____ k. Wax, rubber cement, glue stick, spray mount or double-faced tape used to hold copy to base sheet

_____ l. Thin, flexible sheet of transparent plastic used to make overlays

_____ m. A two-ply, peel-apart film masking material; usually ruby-red film adhered to a clear film base

_____ n. Surface on which copy is pasted up; usually smooth white hot press illustration board or preprinted grid sheet with all critical guidelines in place

_____ o. A sheet of acetate placed over a paste-up to hold copy that will appear in another color; also, a tissue or tracing paper flap to protect paste-up from dirt and damage and indicate instructions to the printer

_____ p. Second overlay or flap of heavy kraft or cover paper sometimes attached to paste-up for added protection and better appearance

_____ q. Edge of a sheet of paper that enters a sheet-fed press first

_____ r. Edge of the press sheet that is printed last

_____ s. To make several halftones at the same enlargement or reduction at one time; also, to group together two or more jobs on a single press run

_____ t. A printed sheet containing a number of pages, usually 4, 8, 16, 32, or 64, that is folded and bound to become part of a publication

_____ u. Arrangement of pages so that when printed, the press sheet can be folded and bound with the pages in proper sequence

_____ v. Large, sturdily built graphic arts camera used to photograph paste-ups and other copy, while at the same time reducing or enlarging the images as needed

_____ w. Abbreviation for photomechanical transfer, a Kodak trade name for a process used to make same size, enlarged, or reduced positive paper, reverse or acetate prints of line and continuous tone copy

_____ x. Process of calculating the percentage by which images should be enlarged or reduced

_____ y. A circular slide rule used to calculate percent that an original image must be reduced or enlarged to yield a specific reproduction size

_____ z. To mark a photograph or drawing to indicate which portions are to be reproduced

_____ aa. To reproduce the whites in an original as black and the blacks as white

_____ bb. A dark image printed over a lighter image area

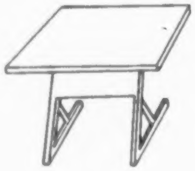
_____ cc. To reproduce a photograph or drawing so that it faces the opposite way

_____ dd. A term indicating that certain areas of a photograph or screen tint are to be left blank or unprinted

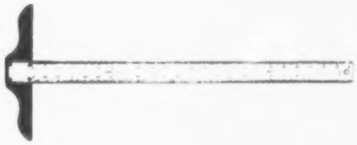
_____ ee. Printed image filling one or more margins and running off the edge of a sheet or page

Objective 2

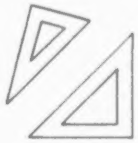
Identify the paste-up tools and materials pictured below.



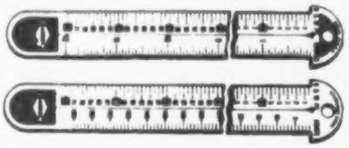
a. ____________________



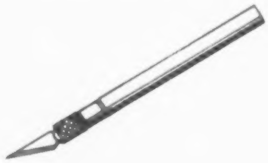
b. ____________________



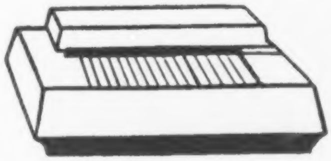
c. ____________________



d. ____________________

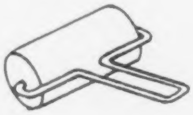


e. ____________________

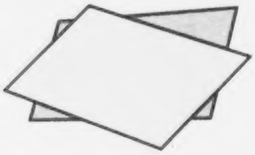


f. ____________________

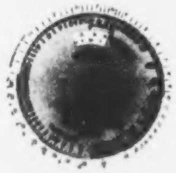
Written Test



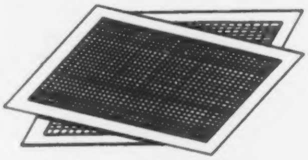
g. ____________________



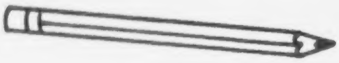
h. ____________________



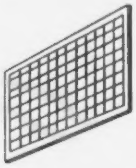
i. ____________________



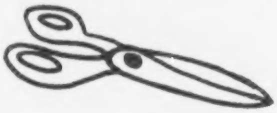
j. ____________________



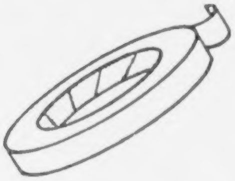
k. ____________________



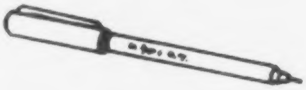
l. ____________________



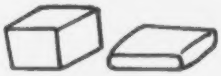
m. ____________________



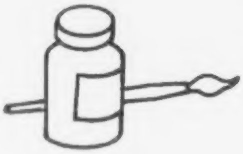
n. ____________________



o. ____________________



p. ____________________



q. ____________________

Objective 3

Select true statements concerning basic paste-up steps by placing an "X" next to the true statements.

_____ a. Organize all tools and materials.

_____ b. Place grid or base sheet anywhere on the table.

_____ c. Draw trim marks in nonreproducing light blue.

_____ d. Cover finished paste-up with tissue or tracing paper overlay.

_____ e. Check paste-up against layout or dummy.

Objective 4

Match the registration methods with their descriptions.

Note: Answers may be used more than once.

1. Register marks
2. Register pin system

_____ a. Common, accurate method of registering multiple exposures

_____ b. Small designs placed on artwork

_____ c. Duplicate designs placed on overlays

_____ d. Pins placed on illustration board

Objective 5

Select true statements concerning use of clear acetate and ruby film by placing an "X" next to the true statements.

_____ a. To produce mechanical color overlays, paste the black copy to the base sheet and each additional color on an acetate overlay.

_____ b. When preparing for process color, paste the original art in position on the base sheet and indicate that it is to be printed in process color.

_____ c. Prepare a ruby film overlay for each screen tint area to be printed.

_____ d. When preparing dropouts, original artwork does not need register marks.

_____ e. For windows, cut ruby film and peel away from all areas except where photos will appear.

Written Test

Objective 6

Complete the following statements related to processing art for production by circling the correct words.

a. (**Cropping, Scaling**) is done to eliminate unnecessary portions of art.

b. The (**proportional scale, diagonal line**) method of scaling involves lining up width of original with size wanted on an outer circle.

c. The formula method of scaling uses the equation of

$$\left(\frac{W}{H} = \frac{w}{h} \quad \text{or} \quad \frac{W}{w} = \frac{H}{h} \right)$$

d. The point of intersection will be the new height of scaled copy in the (**diagonal line, formula**) method of scaling copy.

Objective 7

Match the kinds of imposition with their descriptions.

Note: Answers may be used more than once and two terms may apply to one description.

1. Printed-one-side
2. Sheetwise
3. Work and tumble
4. Work and turn

_____ a. Also referred to as print and turn

_____ b. Same gripper edge, both press runs

_____ c. Also referred to as work and back

_____ d. Uses different gripper edge, both runs

_____ e. Prints one side of sheet with each pass through press

_____ f. Requires two plates, one to print front side of press sheet, and one to print back

Objective 8

Select true statements concerning postal regulations by placing an "X" next to the true statements.

_____ a. Cards and letters must be a minimum of 3 1/2" high x 5" long.

_____ b. Pieces under minimum size are not mailable.

_____ c. Length may not be more than 2.5 times or less than 1.3 times the height.

_____ d. The minimum on third class bulk mail is 200 pieces or 50 pounds of material of identical size and weight.

_____ e. U.S. Postal Service specifications and negatives must be used for business reply cards.

_____ f. A flat rate is charged to all customers mailing third class bulk mail.

***Permission to duplicate this test is granted.**

Answers to Written Test

Objective 1

a.	11	i.	18	q.	15	y.	23
b.	13	j.	6	r.	29	z.	9
c.	7	k.	2	s.	14	aa.	24
d.	5	l.	1	t.	27	bb.	28
e.	17	m.	25	u.	16	cc.	12
f.	20	n.	3	v.	22	dd.	10
g.	30	o.	19	w.	21	ee.	4
h.	31	p.	8	x.	26		

Objective 2

a. Drawing table
b. T-square
c. Triangles
d. Line gauge
e. X-Acto knife
f. Waxer
g. Burnishing roller
h. Mechanical films
i. Proportional scale
j. Grid or base sheets
k. Nonreproducing light blue pencil
l. Trimboard
m. Scissors
n. Masking or drawing tape
o. Fine-tipped black pen
p. Erasers
q. Opaque white paint or correction fluid

Objective 3

a, d, e

Objective 4

a. 2
b. 1
c. 1
d. 2

Objective 5

a, c, e

Objective 6

a. Cropping
b. Proportional scale
c. $\frac{W}{H} = \frac{w}{h}$
d. Diagonal line

Answers to Written Test

Objective 7

a. 4
b. 2 or 4
c. 2
d. 3
e. 1
f. 2

Objective 8

a, c, d, e

Prerequisites:
None

Learning Activities Sheet

Student Name ____

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

☐ 3 **Study** Information Sheet, Objectives 1 through 3.

Optional 📼 ☐ 4. **View** Video entitled *Paste-Up*.

☐ 5. **Observe** Demonstration of procedures to be used in completing Job Sheet 1.

☐ 6. **Do** Job Sheet 1, "Prepare a Paste-Up."

☐ 7. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 8. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 1 and repeat steps 3, 5. and 6.

☐ 8. **Study** Information Sheet, Objectives 4 and 5.

☐ 9. **Observe** Demonstration of procedures to be used in completing Job Sheet 2.

☐ 10. **Do** Job Sheet 2, "Prepare Overlays Using Clear Acetate and Ruby Film."

☐ 11. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 12. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 2 and repeat steps 8 through 10.

☐ 12. **Study** Information Sheet, Objectives 6 through 8.

Learning Activities Sheet

☐ 13. **Observe** Demonstration of procedures to be used in completing Job Sheet 3.

☐ 14. **Do** Job Sheet 3, "Crop a Photograph."

☐ 15. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 16. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 3 and repeat steps 12 through 14.

☐ 16. **Observe** Demonstration of procedures to be used in completing Job Sheet 4.

☐ 17. **Do** Job Sheet 4, "Scale Copy."

☐ 18. **Stop** Have instructor evaluate your performance and if the evaluation is satisfactory, continue to step 19. If the evaluation is not satisfactory, study the procedure outlined in Job Sheet 4 and repeat steps 16 and 17.

☐ 19. **Check** With instructor for any additional assignments to be completed.

☐ 20. **Do** Additional assignments listed below.

____

____

____

☐ 21. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 22. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

***Permission to duplicate this form is granted.**

Unit 11 Proof Procedures and Legal Considerations

Unit Contents

Teacher Components

Teacher Page

Suggested Activities 11–3
Answers to Assignment Sheet 11–7
Written Test 11–9
Answers to Written Test 11–15
Learning Activities Sheet 11–17

Transparency Master

1—Proofreaders' Marks 11–19

Student Components

Student Page

Objective Sheet 11–3
Information Sheet 11–5

Assignment Sheet

1—Read and Mark Proof Copy 11–15

Suggested Activities

Instructional Plan

Preparation

- Read the unit carefully and plan for instruction.
- Review "Teaching Suggestions." Plan for classroom activities.
- Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.
- Prepare classroom. Put up posters and charts and display articles and other references related to this unit.
- Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources Used in Developing This Unit" and "Suggested Supplemental Resources" for more information.
- For self-paced instruction, review Learning Activities Sheet. Modify as appropriate to include additional activities and/or resources available in your classroom. Make one copy for each student.
- Make a transparency from the transparency master included in this unit. This appears in the teacher edition only.

Delivery and Application

Unit Introduction (self-paced instruction)

- Provide student with Learning Activities Sheet and unit of instruction.
- Review unit contents with student.
- Have the student complete the steps in the learning activities sheet.

Unit Introduction (group instruction)

- Provide students with unit of instruction.
- Discuss unit and specific objectives.
- Discuss the information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheet. Review with students the criteria for evaluation of this activity.

Suggested Activities

Teaching Suggestions

- Show samples of the types of proofs.
- Demonstrate how to make corrections in proof copy.
- Prepare a bulletin board display showing typographical and other errors and flaws. (Suggest students proof the front page of their hometown newspaper for errors.)
- Write to U.S. Copyright Office, Library of Congress, 101 Independence Avenue S.E., Washington, D.C. 20559-6000 and obtain copyright information.

Evaluation

- Make copies of the written test. Add or modify test items as needed. The written test serves as both a pretest and posttest to assist in measuring each student's competency gains.
- Give and evaluate pretest. Modify lesson plan to include additional instruction for those areas where students were deficient.
- Evaluate the assignment sheet. Rate the student using the criteria listed on the assignment sheet. See Answers to Assignment Sheet for correct answers where applicable. If the student's performance is unacceptable, have the student review the appropriate materials and complete the assignment again.
- Give and evaluate the posttest.
- Meet individually with students to evaluate their progress through this unit of instruction and indicate to them possible areas of improvement.
- Reteach and retest as required.

Resources Used in Developing This Unit

Print Media

- Baird, Russell N. *The Graphics of Communication*. Orlando, FL: Harcourt Brace College Publications, 1993.
- Beach, Mark, and Eric Kenly. *Getting It Printed*. Cincinnati, OH: North Light Books, 1999.
- Dennis, Ervin A., and John D. Jenkins. *Comprehensive Graphic Arts*, 3d ed. Peoria, IL: Glencoe/McGraw-Hill, 1999.
- Prust, Z.A. *Graphic Communications The Printed Image*. Tinley Park, IL: The GoodHeart-Willcox Company, Inc., 1999.
- Romano, Frank J., and Richard M. Romano. *The GATF Encyclopedia of Graphic Communications*. Sewickley, PA: GATF Press, 1998.

Suggested Supplemental Resources

Print Media

- Willen, Matthew. *Practical Proofreading*. Sewickley, PA: GATFPress, 1999.—This is an introductory guide to the techniques of professional proofreading. Item No. 1449

  Available from:

  Graphic Arts Technical Foundation
  200 Deer Run Road
  Sewickley, PA 15143-2600
  Sales: 1-800-662-3916
  www.gatf.org

Electronic Media

- http://www.loc.gov/copyright—United States Copyright Office
  This website contains the following information related to copyrights: general information on copyright basics, legislation, publications, links, registration, etc.

Answers to Assignment Sheet

Assignment Sheet 1

Read and Mark Proof Copy

Proofreading is the art of checking cop y fore errors and
indicating the corrections to be made. Ideally, proofreading is done by
two peoples One is the *copy holder* who reads aloud fromthe original #
copy to the proof reader. The other, called the *proofreader*, follows the
reading proof and marks any corrections necessary. ○

no# Sometimes, however, the proofreader weks alone, checking the
original copy against the proof.

Proofreaders marks (also proof marks) are the symbols used
# bythe proofreader to indicate the corrections necessary *in* the proof. wf
tr Examples of the msot commonly used proof marks are shown on the
following page ⊙

Written Test

Name ______________________________

Date ______________________ Score __________

Objective 1

Match the terms with their definitions.

1. AA
2. Copyright
3. Counterfeiting
4. Fair use
5. Infringement
6. Libel
7. Path line
8. PE
9. Pornography
10. Proof
11. Proof OK
12. Proofreader marks
13. Proofreading

_____ a. Customer signature approving a proof and authorizing the job to advance to the next stage

_____ b. Reading copy on a proof and marking any errors or flaws for correction

_____ c. Symbols and abbreviations used by proofreaders to indicate corrections necessary in the proof

_____ d. A trial reproduction of type and illustrations to reveal errors or flaws

_____ e. A line drawn from error in proof to symbol for error in nearest margin

_____ f. Any change made because of printer or typesetter error

_____ g. Any change in a proof not caused by typesetter's or printer's error; the author pays the charges

_____ h. A written or pictorial statement that conveys an unjustly unfavorable impression

_____ i. Form of protection given by law to authors of literary, dramatic, musical, artistic, and other similar works

_____ j. A limitation on the exclusive rights of copyright owners

_____ k. Using copyrighted material in such a way as to reduce the profits that would otherwise be received by the copyright holder

_____ l. Writing or illustrations considered obscene

_____ m. Making an imitation or copy of a genuine article (money, painting, etc.) with the intent to deceive

Written Test

Objective 2

Select true statements concerning reasons for pulling proofs by placing an "X" next to the true statements.

_____ a. Every job should be checked and double-checked only by the customer.

_____ b. Proofs help determine who is responsible for mistakes and should pay for correcting them.

_____ c. If a proof is OK'd, the customer authorizes the next stage in the production sequence.

Objective 3

Distinguish among types of proofs by writing the correct numbers in the blanks.

1. Blueline or brownline proof
2. Color proof
3. Digital proofs
4. Galley proof
5. Page proof
6. Press proof

_____ a. Proof of a paste-up made on a photocopier to eliminate distractions and preserve the original.

_____ b. Proof made to detect and eliminate errors made by the typesetter; may be made with laser printer, on proof press, or visually edited on computer screen.

_____ c. Expensive proof intended primarily for color separations.

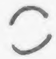
_____ d. Prepress, photographic proof of all pages in a printed job that is used if there are elements that will not show on a photocopy.

_____ e. Proof made on the press using the plates, paper, and ink specified for the job; used primarily for premium four-color jobs.

_____ f. Proof made by outputting electronic files on a high-resolution, high-quality printer

Objective 4

Match the proofreaders' marks with their meanings.


1.

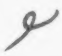
2. #

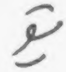
3. wf

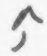
4. bf

5. rom

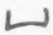
6. ital


7.


8.


9.

10. lc


11.

12. no ¶

13. tr

_____ a. Wrong font

_____ b. Delete

_____ c. Set in roman type

_____ d. Close up

_____ e. Set in bold face type

_____ f. Delete and close up

_____ g. Insert space

_____ h. Set in italic type

_____ i. Run in same paragraph

_____ j. Set in lowercase

_____ k. Transpose

_____ l. Insert comma

_____ m. Lower

Written Test

Objective 5

Select true statements concerning reading, marking, and correcting galley proofs by placing an "X" in the blanks next to the true statements.

_____ a. The objective of reading galley proofs is to discover errors and flaws.

_____ b. The two methods of marking copy are the path line method and the corresponding margin marks method.

_____ c. When correcting cold type composition, reset a whole word, line, or paragraph, not just a character.

Objective 6

Select true statements concerning legal restrictions by placing an "X" in the blanks next to the true statements.

_____ a. Printers and customers must be on guard to prevent becoming involved in legal matters relating to copyrighting, counterfeiting, and pornography.

_____ b. A new copyright law went into effect on January 1, 1978.

_____ c. Copyrighted work is protected for the author's lifetime, plus 70 years.

_____ d. "Works for hire" have copyright protection 50 years from first year of publication or 90 years from the creation, whichever is shorter.

Objective 7

Name the three elements of copyright notice.

a. ______________________________

b. ______________________________

c. ______________________________

Objective 8

Select true statements concerning the tests for judging the "fair use" of copyrighted material by placing an "X" in the blanks next to the true statements.

_____ a. One test for judging "fair use" is the amount of material used in relation to the total material.

_____ b. One must consider the nature of the copyrighted works.

_____ c. The literary significance of the work must be considered.

_____ d. The effect of the use on the commercial market value of the material must be considered.

Written Test

Objective 9

Select from the following list items that may be copyrighted by placing an "X" in the appropriate blanks.

_____ a. Maps

_____ b. Motion pictures

_____ c. Greeting cards

_____ d. Time cards

_____ e. Photographs

_____ f. Slogans

_____ g. Catalogs

Objective 10

Select from the following list items that are not eligible for copyright by placing an "X" in the appropriate blanks.

_____ a. Names

_____ b. Familiar designs

_____ c. Newspapers

_____ d. Paintings

_____ e. Graph paper

_____ f. Titles

_____ g. Pamphlets

Objective 11

Select true statements concerning the provisions for using photographs of people for advertising purposes by placing an "X" next to the true statements.

_____ a. In using pictures of children, written permission of legal guardian must be obtained.

_____ b. Permission is not needed if faces are recognizable.

_____ c. Failure to obtain written permission may result in claim of invasion of privacy and demand for payment.

***Permission to duplicate this test is granted.**

Answers to Written Test

Objective 1

a.	11	f.	8	k.	5
b.	13	g.	1	l.	9
c.	12	h.	6	m.	3
d.	10	i.	2		
e.	7	j.	4		

Objective 2

b, c

Objective 3

a.	5
b.	4
c.	2
d.	1
e.	6
f.	3

Objective 4

a.	3	f.	8	k.	13
b.	7	g.	2	l.	9
c.	5	h.	6	m.	11
d.	1	i.	12		
e.	4	j.	10		

Objective 5

a, b, c

Objective 6

a, b

Objective 7

a. The word "Copyright," the abbreviation "Copr.," or the symbol ©
b. The name of the copyright owner
c. The year of first publication

Objective 8

a, b, d

Objective 9

a, b, c, e, g

Objective 10

a, b, e, f

Objective 11

a, c

Unit 11 Proof Procedures and Legal Considerations

Prerequisites:
None

Learning Activities Sheet

Student Name ______________________________

Place a checkmark in the appropriate box as you complete each of the steps below.

☐ 1. **Take** Pretest provided by instructor. After test has been evaluated, follow instructor's recommendations.

☐ 2. **Read** Objective Sheet.

☐ 3. **Study** Information Sheet, Objectives 1 through 5.

☐ 4. **Do** Assignment Sheet 1, "Read and Mark Proof Copy."

☐ 5. **Stop** Have instructor evaluate the completed assignment sheet and if the evaluation is satisfactory, continue to step 6. If the evaluation is not satisfactory, repeat steps 3 and 4.

☐ 6. **Study** Information Sheet, Objectives 6 through 11.

☐ 7. **Research** Online resources regarding copyrights. Visit http://www.loc.gov/copyright as one of your sources.

☐ 8. **Do** Additional assignments listed below.

____

____

____

☐ 9. **Take** Posttest provided by instructor. After test has been evaluated, follow instructor's recommendations.

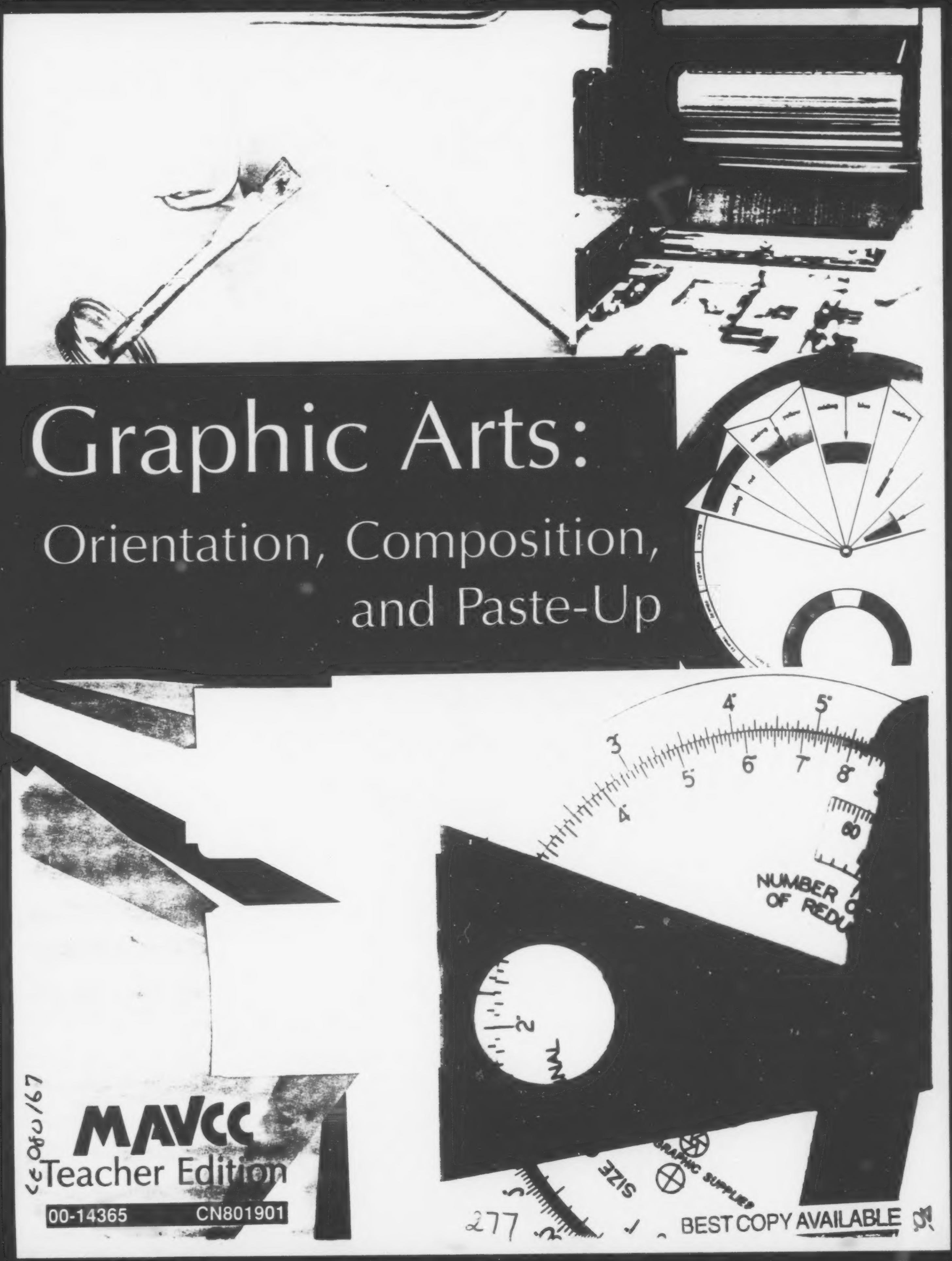
☐ 10. **Stop** Have instructor evaluate your unit performance. If the evaluation is satisfactory, proceed to next learning activities sheet. If evaluation is not satisfactory, ask instructor for further instructions.

***Permission to duplicate this form is granted.**

Proofreaders' Marks

ℊ	Delete
⁀ℊ‿	Delete and close up
9	Turn inverted letter
⁀‿	Close up
#	Insert space
√√√	Equalize spacing
less #	Reduce spacing
¶	Paragraph
□	Indent one em
[	Move to left
]	Move to right
⊔	Lower
⊓	Elevate
∧	Insert marginal addition
X	Broken letter
⊥	Push down space
═	Straighten
‖	Align type
∧,	Insert comma
∨'	Insert apostrophe
∨"	Insert quotes
(/)	Insert parentheses
[/]	Insert brackets
∧	Insert inferior figure
∨	Insert superior figure
=/	Hyphen

|em|	Em dash
|en|	En dash
;/	Insert semicolon
:/	Insert colon
⊙	Insert period
?/	Insert question mark
(?)	Query to author
⌢	Use ligature
(sp)	Spell out
tr	Transpose
set 1, 2, 3	In this order
wf	Wrong font
bf	Set in bold face type
rom	Set in roman type
ital	Set in italic type
Caps	Set in capitals
sc	Set in small capitals
lc	Set in lowercase
B̸	Lowercase letter
stet	Let it stand
no ¶	Run in same paragraph
ld>	Insert lead between lines
hr#	Hair space between letters
out sc	Out–see copy
✱	End of copy


3
4
5
4
5
6
7
8
80
NUMBER
OF REDU
2
SIZE
GRAPHIC SUPPLIES

Graphic Arts:

Orientation, Composition, and Paste-Up

CE080167

MAVCC

Teacher Edition

00-14365 CN801901

277

BEST COPY AVAILABLE

Graphic Arts

Orientation, Composition, and Paste-Up

Fourth Edition

Student Edition

Revised by

Cheryl Licklider

Project coordinated by

Cheryl Barr

Developed by

Multistate Academic and Vocational Curriculum Consortium, Inc.
1500 West Seventh Avenue
Stillwater, Oklahoma 74074-4364

©2000

The Multistate Academic and Vocational Curriculum Consortium does not discriminate on the basis of race, creed, color, national origin, sex, age, religion, veteran status, or qualified handicap.

00-14365 CN801902

Graphic Arts: Orientation, Composition, and Paste-Up

Student Edition

Table of Contents

Units of Instruction

Unit 1: Orientation
Unit 2: Shop Safety
Unit 3: Related Math and Measuring
Unit 4: Shop Organization
Unit 5: Printing Processes
Unit 6: Paper
Unit 7: Typography
Unit 8: Typesetting
Unit 9: Design Principles
Unit 10: Paste-Up Principles and Procedures
Unit 11: Proof Procedures and Legal Considerations

Unit 1 Orientation

Unit Contents

Student Components

Student Page

Objective Sheet 1–3
Information Sheet 1–5

Student Supplement

1—Dramatic Changes for the Future 1–13

Assignment Sheets

1—Research Graphic Arts Careers and Present Information 1–17
2—Determine Graphic Arts Employment Opportunities 1–19
3—Interview Graphic Arts Employees 1–21
4—Visit a Printing Shop 1–23
5—Develop a Career Plan 1–25

Objective Sheet

Unit Objective

After completing this unit, the student should be able to identify major areas of specialization in the graphic arts trade and personal traits and related skills important for successful graphic arts careers. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to graphic arts careers with their definitions.
2. Match the categories of graphic arts careers with their descriptions.
3. Select major areas of specialization in the graphic arts industry.
4. Name types of organizations that employ graphic arts employees.
5. List personal traits and attitudes important for successful graphic arts careers.
6. Select related skills important for successful graphic arts employees.
7. Select personal traits and skills important for graphic arts employees who work with customers.
8. Explain reasons for teamwork.
9. Distinguish between the advantages and disadvantages of a career in graphic arts.
10. Complete statements concerning the ten steps to setting and achieving goals.
11. Research graphic arts careers and present information. (Assignment Sheet 1)
12. Determine graphic arts employment opportunities. (Assignment Sheet 2)
13. Interview graphic arts employees. (Assignment Sheet 3)
14. Visit a printing shop. (Assignment Sheet 4)
15. Develop a career plan. (Assignment Sheet 5)

Information Sheet

Objective 1

Terms and definitions

a. **Apprenticeship**—Method of job training in which an employee in a union shop receives classroom training and on-the-job experience as a means of becoming an experienced journeyman

b. **Career**—Profession or occupation a person takes in life

c. **Craft-centered**—Refers to work done by artisans or others with manual skills

d. **Electronic information transfer**—Sending digital information instantly via telephone lines and satellites

e. **Goal setting**—Process of outlining the steps to be taken to achieve a specific outcome

f. **Lifelong learning**—Upgrading and updating one's job skills and knowledge to keep pace with technological changes in a field

g. **Manager**—Person in charge of managing an enterprise or business

h. **Outsourcing**—Subcontracting with an outside company to provide a specific service needed to complete a product

i. **Robotics**—Use of machines to do repetitive tasks, especially in manufacturing

Objective 2

Categories of graphic arts careers and their descriptions

The graphic arts industry needs people with many different interests, talents, and abilities. The graphic arts workforce can be organized into six general categories.

a. Skilled technical personnel—Operate sophisticated machinery and carry out tasks that directly involve machines, materials, and products

b. Creative personnel—Skilled in writing, art, and design

c. Management personnel—Supervise the work of others and enjoy working with people

d. Support personnel—Link between products and customers

e. Engineers and scientists—Apply science and mathematics principles to research, design, and construct complex products

f. Entrepreneurs—Start their own business in one of the many areas available in the graphic arts field

Objective 3

Major areas of specialization in the graphic arts industry

Note: Computerization has been introduced into virtually every facet of graphic arts production.

a. Management

b. Sales and customer service

c. Writing, design, and layout

d. Desktop publishing

e. Proofreading

f. Paste-up

g. Electronic prepress

h. Graphic arts photography

i. Stripping and imposition

j. Platemaking

k. Press operation

l. Bindery (folding, binding, and finishing)

Objective 4

Types of organizations that employ graphic arts employees

a. Commercial printing plants

b. In-house printing plants

c. Newspapers

d. Magazine publishers

e. Book publishers

f. Yearbook publishers

g. Greeting card publishers

h. Business form printers

i. Financial and legal printers

j. Specialty shops

Examples: Quick printers, design shops, typesetters, color separation services, bindery/finishing services

k. Packaging manufacturers

l. Advertising agencies and public relations firms

m. Printing supply firms

n. Printing machinery companies

o. Paper merchants

p. Federal and state agencies

q. Universities and colleges

Objective 5

Personal traits and attitudes important for successful graphic arts careers

a. **Adaptability**—Adjusting to new situations
   - Accept changes without complaint.
   - Learn new procedures and continue education.

b. **Cooperation**—Working harmoniously with others
   - Observe rules and regulations.
   - Help others when possible.
   - Work well with co-workers, supervisor, and employer.

c. **Courtesy**—Being polite and having good manners
   - Show respect for employer.
   - Show respect for the customer.
   - Speak clearly and pleasantly.
   - Return promptly from lunch and breaks so co-workers can have their rest periods.

d. **Dependability**—Doing what you say you will and completing your assigned duties
   - Work regularly.
   - Be on time.
   - Take only the time allowed for lunch and breaks.
   - Do all work assigned.
   - Follow instructions.

e. **Enthusiasm**—Being eager to help or take part in some activity
  - Show pride in doing job.
  - Look alert.
  - Do more than your share when time permits.

f. **Honesty**—Being truthful in all things
  - Be careful with money.
  - Give truthful information to employers, customers, and co-workers.
  - Keep promises.
  - Do not waste time.

g. **Initiative**—Doing things without being told
  - Be productive.
  - Use slack moments or leisure time to learn more about job.
  - Show an interest in learning and doing a good job.
  - Suggest ideas.
  - Anticipate needs for a job.

h. **Loyalty**—Supporting a cause
  - Keep confidences.
  - Avoid public criticisms of employer, supervisor, or co-workers.
  - Do not discuss wages or raises with other employees.

i. **Patience**—Taking the time to do things right

j. **Self-control**—Being able to control one's temper and emotions
  - Control temper.
  - Accept objective criticism.
  - Maintain poise.

k. **Tact**—Being able to say the right thing at the right time.
  - Try to understand the needs and desires of others.
  - Do not correct customers, co-workers, or employer in a disagreeable manner.
  - Learn to take care of customer complaints.

Objective 6

Related skills important for successful graphic arts employees

a. Ability to operate printing equipment correctly
b. Accuracy
c. Speed
d. Neatness
e. Ability to work without direct supervision
f. Desire for perfection
g. Willingness to work shifts, weekends, overtime

Objective 7

Personal traits and skills important for graphic arts employees who work with customers

Note: Many graphic arts employees may be required to serve as liaisons between customers, management, sales, and production. It is imperative that graphic arts employees acquire a unique set of skills and a strong work ethic.

a. Personal traits
  - Act maturely and fairly
  - Strong work ethic
  - Positive attitude
  - Treat customers with courtesy and politeness
  - Make decisions based on facts rather than personal opinions

b. Skills
  - Knowledge of job schedules and job progress
  - Understand operation of the firm
  - Communicate effectively with customers, particularly on the telephone
  - Ability to make clear, logical decisions

Objective 8

Reasons for teamwork

a. Provides for the work to be done more quickly
b. Provides for the work to be equally shared
c. Provides for heavy loads to be handled more easily
d. Provides for a degree of comradeship rather than isolation
e. Provides for difficult jobs to be done more easily

Information Sheet

Objective 9

Advantages and disadvantages of a career in graphic arts

a. Advantages

- Open job market
- Rapidly growing industry
- Quick advancement and pay increases
- Available overtime opportunities
- Comfortable indoor working conditions
- Variety of challenging tasks
- Sense of pride and satisfaction

b. Disadvantages

- Close work confinement
- Pressure of work deadlines
- Rigid standards for accuracy
- Long hours during peak production periods
- Most good employment opportunities are confined to metropolitan areas.

Objective 10

Ten steps to setting and achieving goals

Note: The best opportunities in life are the ones you create. Goals provide direction and enable you to observe your progress.

a. Write it down—Goals are specific, measurable, and time bound. Write your goals so they reflect all three components.

b. List your personal benefits—Identify exactly why you want to achieve this goal. List all the ways you will benefit personally.

c. Analyze your current position—Success is information independent. You need integrity in your information. Identify your specific strengths, weaknesses, and opportunities as they relate to achieving this goal.

d. Identify obstacles and risks—List everything that could possibly prevent you from achieving this goal.

e. Identify investments and sacrifices—List everything, including time, money, and sacrifices that you can anticipate.

f. List your knowledge requirements—Identify what additional knowledge you need to acquire or have access to.

g. Form a support team—List the people, groups, and organizations you may need help from as well as the specific role each one plays.

h. Develop your plan—List in chronological order each activity and corresponding target dates for completion. Use all the information gathered in previous steps to develop your plan.

i. Set a deadline—Determine the date by which you will have achieved this goal.

j. Reward and celebrate—Identify your reward for the achievement of this goal. You deserve it!

Student Supplement 1—Dramatic Changes for the Future

The printing industry has been undergoing unprecedented change and will continue to do so. Digital technology, economic restructuring, global competition, market shifts, emerging new media, and other forces are combining to dramatically change the operating environment. The printing industry, like many other industries, is in a difficult transition period, moving from the prosperity of a mature industrial society to the uncertainty of an emerging information society.

There are two major factors driving these changes. First, technology, particularly the digitization of data, is reshaping the communications industries. At the least, it is changing where and how existing products are produced. The changes stretch beyond this to the form of products and the role that printers play. At the extreme, they will redefine how we communicate as we experience the convergence of computers, telecommunications and television, and the creation of "multimedia" and the so-called "information superhighway."

The second factor is the rapid restructuring of the North American economy and global competition which creates modest overall economic growth instead of the steady strong growth experienced in the U.S. and western Europe during the last 50 years.

The printer's role in this new "digital," "global" future is still evolving, although most foresee a blurring of the difference between printers, broadcasters, software and hardware developers, and others. The term "printer" with its implied "ink on paper" will be increasingly inappropriate. The traditional prepress services are evolving into a distinctive imaging business with the potential of feeding a wide range of media, only one of which will be print. Increasingly, printers' reliance on ink on paper for sales and profits will shift to new products and services focused on the integration of data and multimedia.

John Walter, chairman and chief-executive-officer of R.R. Donnelley, has indicated that, in his view, in the near future as much as 50 percent of the sales revenues of printers may be from products and services they do not produce today. The implication is that many of today's printed products and printing services will decline in use while both new products and services and alternative electronic ways of publishing information will be developed and grow in use. Printers already are producing alternative media with many involved in software production, compact disk read-only memory (CD-ROM) production, data and text storage and print-on-demand, and a small percentage in video production.

Printers are redefining their business to one of identifying customers' changing communication needs brought about by the digital processing and storage of information and delivering it through the most effective distribution channel. Since printers are already well established in imagery, they are well positioned to participate in the new channels as they develop.

Changes to Industry Structure and Profits

The printing industry, like many others, is undergoing a rapid restructuring as a result of technological changes and market forces. Over the past 30 years industry profitability has moved in cycles corresponding roughly to industry investment cycles. With the current need to invest in new digital technology coinciding with a slowing of market growth, printing firm profits will be squeezed further into the new century. The implications for industry structure and profitability are:

1. The number of larger printing plants is declining. Large printing firms are becoming larger, at the expense of less well-managed large companies and medium-size firms.

2. Technology and other trends favor entrepreneurial smaller printers. However, the less innovative of these smaller printers will face serious problems in a slow-growth business environment. So, when the number of smaller printers and related firms continue to grow, the rate of failure for less well-managed small firms could be quite high. Medium-size firms, particularly those without well-defined specialty niches, will continue to be squeezed by firms of all sizes with specialized equipment.

3. The impact on industry profitability is a continuation of the pressure on overall industry profit margins. However, the profit leaders will continue to make attractive profits and the remainder of firms will feel most of the squeeze on profits.

The Printer's Bridge to a Digital Future

Survival of the printer in the 21st Century will depend upon how well one integrates the following two broad issues into a career.

1. First, all printers will have to address the question of how their internal operations are interconnected digitally and how they are also connected to their customers and suppliers. The question involves connecting through telephone or private data networks to customers and suppliers; the considerations here are productivity, profitability, and customer demands for rapid service.

2. Second in the long run, higher growth opportunities will be available in new rather than traditional media. Printers of all sizes are already producing CD-ROM products, interactive catalogs, and the like, but smaller printers serving specializing markets also have opportunities to experiment with new media today; with minimal effort, pages designed to be printed on paper may also be pages designed to be displayed on a computer screen, or as an Internet home page. The greater acceptance and use of personal computers, for instance, the greater the opportunities for some printers to move into this medium.

In short, if your view of the printing industry is confined only to "ink on paper" impression technology, chances are good you will find yourself seeking employment more frequently during your career than an individual whose vision and skills include flexibility and the ability to adapt to non-traditional business opportunities. After all, as the saying goes, "Change is the only constant in this world."

Objective 11

Assignment Sheet 1—Research Graphic Arts Careers and Present Information

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Directions were followed	______
• Presentation indicated proper search was made	______
• Assignment was completed on time	______
• Presentation was 3 to 5 minutes long	______

Basic Skills

Reading Writing Oral Communication Employability

Introduction

In this unit you will be introduced to categories of careers in graphic arts and areas of specialization. You will also study the traits and personal skills important for career success in the graphic arts industry.

Directions

Use the Internet and periodicals found in your facility and local library to gather information on at least two career areas in the graphic arts field. You may also contact employees in the graphic arts industry. Use these resources to compile information on the careers including necessary training, working conditions, job responsibilities, approximate salary, etc.

Organize information for your presentation on five to ten 3″ x 5″ index cards. Your presentation to the class should be three to five minutes in length.

Below are a few resources you might want to utilize in your research.

Graphic Arts Monthly
345 Hudson St. 4th Floor
New York, NY 10014
Tel: 212-519-7320
www.gammag.com

American Printer
Reader Service Department
650 S. Clark Street
Chicago, IL 60605-9960
www.americanprinter.com

Desktop Publishers Journal
462 Boston Street
Topsfield, MA 01983-1232
Tel: 978-887-7900
www.dtpjournal.com

Publish
P.O. Box 5039
Brentwood, TN 37024-5039
Toll-free: 1-800-656-7495
www.publish.com

Objective 12

Assignment Sheet 2—Determine Graphic Arts Employment Opportunities

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Information is accurate	______
• Student effort in project is evident	______
• Student offered valid reasons for selecting a job of interest	______
• Assignment was completed on time	______
• Assignment was neat and legible	______

Basic Skills

Reading Writing Employability

Materials list

- Classified section from a local newspaper

Directions

Using the classified ads from a local newspaper, determine as many employment opportunities as possible related to the graphic arts industry in your community. List these jobs and the places of employment below.

	Job	**Type of Company**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Assignment Sheet 2

How many job listings were you able to find? ____________________

In which job are you the most interested? ____________________

____

Explain why: ____

____

____

____

234

Objective 13

Assignment Sheet 3—Interview Graphic Arts Employees

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Information is presented in a clear, concise manner	______
• Assignment was completed on time	______
• Assignment was neat and legible	______

Basic Skills

Reading Writing Oral Communication Employability

Directions

Interview people in skilled positions, as well as those in management, at a local printing plant to determine information that would help you better understand this trade. Ask each person you interview the following questions.

1. What is your position? ______________________
2. What are the job responsibilities? ______________________
3. What are the advantages of this job? ______________________
4. What are the disadvantages of this job? ______________________

Assignment Sheet 3

5. What training requirements are needed to be employed in this job?

____

____

6. What is the approximate salary? ______________________________

7. What other information should a prospective employee in the graphic arts industry know about this job? ______________________________

____

____

Objective 14

Assignment Sheet 4—Visit a Printing Shop

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Information is presented in a clear, concise manner	_____
• Information is accurate portrayal of shop visited	_____
• Assignment was completed on time	_____
• Assignment was neat and legible	_____

Basic Skills

Reading Writing Oral Communication

Directions

Visit a local commercial or in-house printing shop or the production facility for a newspaper or magazine.

1. Attempt to locate the following graphic arts phases: writing, design, and layout; desktop publishing; proofreading; paste-up; electronic prepress; graphic arts photography; stripping and imposition; platemaking; press operation; and bindery (folding, binding, and finishing).

   Note: Depending on the print shop visited, some of these graphic arts phases may have been replaced by computerized methods. For example, many print shops have replaced the paste-up phase with electronic prepress.

2. Ask the printing plant representative why each graphic arts phase is physically located where it is. Has it been changed recently?

3. Complete the chart on the following page.

Assignment Sheet 4

Graphic Arts Phase	Location	Why Location Was Chosen

Objective 15

Assignment Sheet 5—Develop a Career Plan

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Student followed directions	______
• Student completed career plan	______
• Assignment was completed on time	______
• Assignment was neat and legible	______

Basic Skills

Reading Writing Employability

Directions

Complete the student career plan on the following page. Submit completed career plan to instructor for evaluation.

Assignment Sheet 5

STUDENT CARERE PLAN

Date: ______________

Personal Data

Last Name First Name M.I. Date of Birth

Address Home Phone/Message No.

City State Zip Code Social Security Number

Projected Graduation/Program Completion Date ______________

Career/Educational Goal(s)

11th Grade Career Goal(s)	**12th Grade** Career Goal(s)	**Post-Secondary** Career Goal(s)	**Post-Secondary** Career Goal(s)
Educational Goal(s)	Educational Goal(s)	Educational Goal(s)	Educational Goal(s)

Interests

Grade	**School Activities** (clubs, organizations, sports, committees)	**Community Activities** (clubs, committees, organizations)	**Interests/Hobbies**
11th			
12th			
Post-Secondary			
Post-Secondary			

Employment History

Employer & Address	**Dates Employed**	**Type of Work & Responsibilities**	**Comments**

Shadowing, Apprenticeship, or Supervised Work Experience

Employer & Address	**Dates Employed**	**Type of Work & Responsibilities**	**Comments**

300

Unit Contents

Student Components

Student Page

Objective Sheet 2–3

Information Sheet 2–5

Student Supplement

1—Guidelines for Interpreting Material Safety Data Sheets 2–17

Assignment Sheets

1—Complete a Student Safety Pledge Form 2–21
2—Survey the Shop and Identify Correct Safety Practices 2–23
3—Interpret a Material Safety Data Sheet 2–27
4—Draw a Floor Plan and Locate Safety Equipment in Your Shop 2–31

Job Sheets

1—Operate a Fire Extinguisher 2–33
2—Lift a Heavy Object Properly 2–35

Objective Sheet

Unit Objective

After completing this unit, the student should be able to interpret a material safety data sheet and identify and follow correct shop safety practices. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 100 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to shop safety with their definitions.
2. Select true statements concerning proper safety rules to be practiced in the shop.
3. Complete statements concerning maintaining a safe and orderly shop.
4. List examples of personal protective equipment which might be required in a print shop.
5. Select true statements concerning toxic chemical safety rules.
6. Complete statements concerning purposes of a material safety data sheet (MSDS).
7. List the five kinds of safety hazards.
8. Select true statements concerning things OSHA expects of an employer.
9. Select true statements concerning things OSHA expects of an employee.
10. Match the colors of the safety color code with their designations.
11. Select true statements concerning the characteristics of lockout/tagout.
12. Label the components of the fire triangle.
13. Match the classes of fires with their descriptions.
14. Match types of fire extinguishers with their uses.
15. Match fire extinguisher symbols with their meanings.
16. List the general guidelines for first aid emergencies.
17. Complete statements concerning bloodborne pathogens and special first aid precautions.
18. Complete statements concerning lifting and carrying items safely.

Objective Sheet

19. Complete a student safety pledge form. (Assignment Sheet 1)

20. Survey the shop and identify correct safety practices. (Assignment Sheet 2)

21. Interpret a material safety data sheet. (Assignment Sheet 3)

22. Draw a floor plan and locate safety equipment in your shop. (Assignment Sheet 4)

23. Operate a fire extinguisher. (Job Sheet 1)

24. Lift a heavy object properly. (Job Sheet 2)

303

Information Sheet

Objective 1

Terms and definitions

a. **Accident**—Any suddenly occurring, unintentional event which causes personal injury or property damage

b. **Combustibles**—Materials or liquids that catch fire easily

c. **First aid**—Immediate, temporary care given the victim of an accident or sudden illness until the services of a physician can be obtained

d. **Hazard**—A potential source of danger

e. **Material safety data sheet (MSDS)**—Written or printed material concerning a hazardous chemical

f. **Occupational Safety and Health Administration (OSHA)**—Federal agency established to ensure safe and sanitary working conditions for employees

g. **Right-To-Know**—Statutory right of access to every public record of a state or federal agency

h. **Safety**—State or condition of being safe; freedom from danger, risk, or injury

Objective 2

Shop safety rules

a. Conduct yourself in a manner conducive to safe shop practices.

b. **Do not** use any equipment until you understand how to use it.

c. Operate any presses or electrically powered equipment only after obtaining the approval of your instructor.

d. **Never** walk away from equipment that is running.

e. Always keep your hands away from a machine's moving parts.

f. Use the correct tools and equipment when doing a job.

g. Limit the operation of the paper cutter, paper drill, and stitcher to one person at a time.

h. Tie back long hair prior to operating any press or power equipment.

i. Remove ties, scarves, loose clothing, rings and other jewelry before operating any press or power equipment.

j. **Do not** sit or lean on light tables.

k. Avoid touching or looking directly at light sources.

l. Wear eye protection in areas where flying objects and splashing solutions are possible.

m. Wear hearing protection when subjected to continuous loud noise.

n. Wash hands and arms with soap and water frequently to help prevent skin irritation from inks and solvents.

o. **Do not** engage in horseplay, scuffling, or practical joking in the classroom or shop.

p. Use the "buddy system" when working in the graphics laboratory.

Objective 3

Maintaining a safe and orderly shop

a. Report any unsafe condition in the shop immediately.

b. Arrange all machinery and equipment to permit safe and efficient operation.

c. Keep materials and supplies safely stacked and stored.

d. Keep all tools and accessories in cabinets or tool racks.

e. Dispose of or store all combustible materials in safe containers.

f. Keep all floors clean and free of debris at all times.

g. Check that adequate housekeeping equipment and cleaning materials are on hand to ensure that maximum cleaning efficiency can be maintained.

h. Participate in daily cleanup periods.

Objective 4

Personal protective equipment

a. Safety glasses

b. Earplugs

c. Face shields

d. Steel-toe shoes

e. Protective gloves

Objective 5

Safety rules regarding toxic chemicals

Note: Depending upon the size of the printing plant and the types of waste products generated there, regulations concerning how wastes are to be disposed differ. Many operations recycle paper, trimmings, lithography film, and processing fluids to recover some costs from wastage. Others, in addition to recycling, may be mandated to maintain approved containers for storage of used inks, solvents, and press washdown fluids. In any case, the astute employee will be interested in the employer's policies concerning the disposal of wastes and materials various agencies might label toxic, hazardous, or otherwise worthy of special handling.

a. Work in a well-ventilated area.

b. Wear protective gloves and aprons when handling chemicals.

c. Wear protective splash-proof goggles when working with acids and caustic chemicals.

d. Know the dangers of each chemical.

e. Pour chemical into water, never water into chemical.

   Note: Some chemicals react violently to water or to having water added to them. Pouring the chemical into water ensures a rapid dilution, whereas pouring water into a chemical could cause splashing or boiling.

f. Read container labels carefully before using products.

Caution: Do not use products that are not labeled.

g. Store chemicals on lower shelves of locked metal cabinets.

   Note: Be sure cabinets are located in an area that meets local, state, and national codes.

Objective 6

Purposes of a material safety data sheet (MSDS)

Note: The Federal Occupational Safety and Health Administration, administered by the U.S. Department of Labor, requires employers to keep material safety data sheets on all hazardous substances used by employees. Employees should be aware of their responsibilities and those of their employers concerning access to MSDS information and training.

a. To inform the user of the material's physical properties or fast-acting health effects that make it dangerous to handle

b. To tell the user the level of protective gear needed

c. To tell the user the first aid treatment necessary if exposed to the product or its hazards

d. To tell the management and the user the preplanning needed for safely handling spills, fires, and day-to-day operations with the material

e. To tell the user how to respond to accidents

Objective 7

Kinds of safety hazards

a. Mechanical

b. Fire

c. Chemical

d. Light

e. Noise

Objective 8

Things OSHA expects of an employer

a. Provide a hazard-free workplace and comply with occupational safety and health standards.

b. Inspect job sites to ensure they meet safety standards.

c. Use properly color-coded signs to warn of danger.

d. Obtain a material safety data sheet (MSDS) for each hazardous chemical present in the workplace and make sure any chemical containers are properly labeled and that MSDSs are readily accessible to employees.

e. Formulate and implement a training program for employees that informs them of any and all chemical substances to which they are exposed and trains them in the proper handling of such substances.

f. Keep required records of work-related injuries and post an annual summary in February of each year.

g. Report to OSHA within 48 hours any accident which is fatal or hospitalizes five or more workers.

h. Post in a prominent place OSHA poster #2203 informing workers of their rights and responsibilities.

Objective 9

Things OSHA expects of an employee

a. Read the OSHA poster #2203 and comply with its standards.

b. Follow employer safety and health rules and wear prescribed clothing or protective equipment on the job.

c. Report any hazardous conditions to a supervisor.

d. Report all job-related injuries to a supervisor and seek prompt treatment if required.

e. Report to OSHA in a responsible manner any hazardous working situations which you feel the employer has not attended to properly.

Objective 10

Colors and designations of the safety color code

a. Green—Designates location of safety and first aid equipment

b. Yellow—Designates caution and marks physical hazards

Examples: Operating levers, handles, areas where tripping would be hazardous, waste containers for combustible materials

c. Orange—Designates dangerous parts of equipment which may cut, crush, shock, or otherwise injure

Examples: Electrical switches, fuses, electrical power boxes, movable guards

d. Red—Designates location of firefighting equipment

Examples: Emergency fire exits, fire extinguishers; also emergency stop switches on machinery, portable containers of flammable liquids

e. Ivory—Highlights an area that might otherwise not be noticed

Examples: Edges of tools, vise jaws, label edges

Objective 11

Characteristics of lockout/tagout

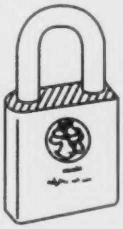
a. Lockout/Tagout is a standard established by the Occupational Safety and Health Administration (OSHA).

b. The purpose of lockout/tagout is to prevent people from being injured while repairing, maintaining, inspecting, and adjusting equipment by controlling all energy sources used, stored, or produced by the equipment.

c. Locking out equipment is the only sure way to prevent serious or fatal injuries that could result from unexpected energizing or start-up of the machine.

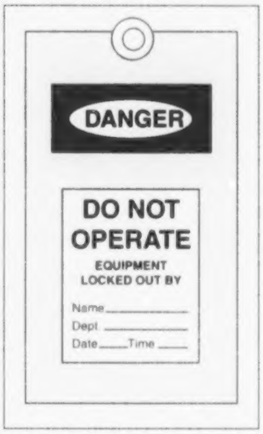
d. Lockout devices utilize a key or combination-type lock to hold an energy-isolating device (such as a manually operated electrical circuit breaker) in the safe position to prevent machine from energizing.

Figure 1—Lockout device



e. Tagout devices are prominent warnings such as a tag securely attached to an energy-isolating device. When you find a tagged power box, make no attempt to restore the power until repairs are made and the tag is removed by the person who placed it there.

Figure 2—Tagout device

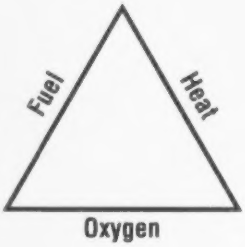

DANGER
DO NOT OPERATE
EQUIPMENT LOCKED OUT BY
Name
Dept
Date
Time

Objective 12

Components of the fire triangle

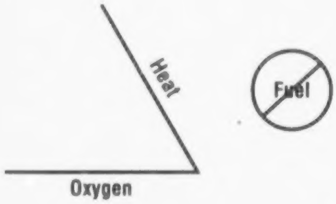
Note: The fire triangle represents the three elements necessary for fire. Combustion can occur only when all three elements are present at the same time and the triangle is complete. A fire will stop if any part of the fire triangle is missing.

Figure 3


Fuel
Heat
Oxygen

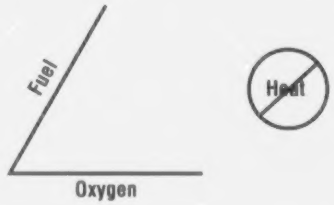
a. Fuel—Any combustible material

Figure 4


Heat
Oxygen
Fuel

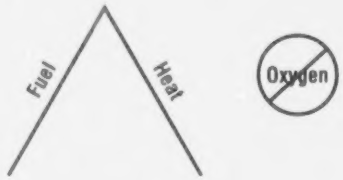
b. Heat—Enough to raise the fuel to its ignition temperature

Figure 5



c. Oxygen—Necessary to sustain combustion

Figure 6



Objective 13

Classes of fires and their descriptions

a. **Class A**—Fires that involve ordinary combustible materials such as wood, rags, paper, and trash

b. **Class B**—Fires that involve flammable liquids such as blanket wash, gasoline, oil, and grease

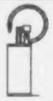
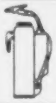
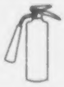
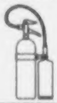
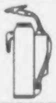
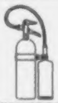
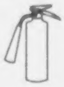
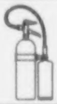
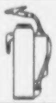
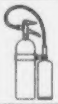
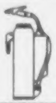
> **Caution:** Never apply water to a flammable liquid or gas fire; such action can cause the fire to spread.

c. **Class C**—Fires that involve electrical or electronic equipment such as motors, switchboards, and electrical wiring

d. **Class D**—Fires that involve combustible metals such as powdered aluminum and magnesium

Objective 14

Types of fire extinguishers and their uses

Type of Fire	Approved Type of Extinguisher				
	Pressurized Water	Carbon Dioxide	Multi-Purpose Dry Chemical	Halon Gas	Foam
Class A Fires ORDINARY COMBUSTIBLES • Wood • Paper • Cloth, etc.					
Class B Fires FLAMMABLE LIQUIDS, GREASE • Gasoline • Paints • Oils, etc.					
Class C Fires ELECTRICAL EQUIPMENT • Motors • Switches, etc.					
Class D Fires COMBUSTIBLE METALS • Magnesium • Phosphorus • Iron					

a. **Foam**—Spray foam above fire, allowing foam to fall lightly on the fire; use for class A or class B fires.

Caution: Do not spray a stream directly into the fire.

b. **Carbon dioxide (CO_2)**—Direct discharge as close to fire as possible, first at the edge of flames, then gradually forward and upward; use for class B or class C fires.

c. **Pressurized water**—Direct stream at base of fire; use for class A fires only.

d. **Dry chemical**—Direct at the base of the flames, then follow up by directing at remaining materials that are burning; use for all classes of fires.

e. **Halon**—Stand back several feet, hold container upright and direct at the base of fire, sweeping from side to side; use for class B or class C fires.

Note: Halon is a clean, pressurized, liquefied gas which does not leave a residue.

Caution: A high concentration of burned halon gas may be hazardous to your health.

311

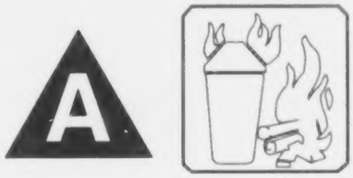
Objective 15

Fire extinguisher symbols and their meanings

Note: All portable fire extinguishers are labeled with picture and shape symbols. Each of the shape symbols contains the letter of the fire class for which the extinguisher is effective. Because speed is important when a fire is discovered, you should be able to glance at the symbols and know immediately whether the extinguisher is appropriate for the fire on hand.

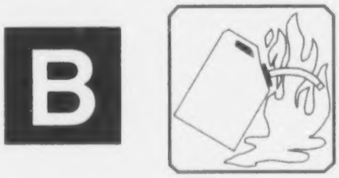
a. Class A—Green triangle

Figure 7



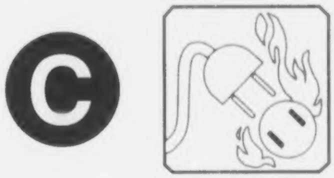
b. Class B—Red square

Figure 8



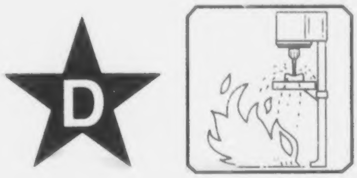
c. Class C—Blue circle

Figure 9



d. Class D—Yellow star

Figure 10



Objective 16

General guidelines for first aid emergencies

a. Turn off power.

b. Administer first aid.

> **Caution:** Be sure you have a valid reason for any first aid you administer.

c. Reassure the injured person that everything possible is being done.

Note: Hearing the concerned voice of a coworker is psychologically comforting to an injured person and may actually lessen the possibility of the onset of shock.

d. Report all accidents and injuries to your instructor or jobsite supervisor, no matter how minor they may seem.

Note: Follow emergency procedures that have been adopted by the local school board.

e. Make accurate notes about the accident including name of victim, time, place, cause or nature of the accident, and any first aid that was administered.

Note: It is the responsibility of the school, the jobsite supervisor, or the medical facility to notify the victim's family.

Objective 17

Bloodborne pathogens and special first aid precautions

a. In any situation involving blood or body fluids, there is a small, but real, risk of infection from very serious bloodborne pathogens.

b. Bloodborne pathogens are disease-causing microorganisms carried in the blood. These include:

- HIV (human immunodeficiency virus), which eventually develops into AIDS (acquired immune deficiency syndrome), a fatal disease, and
- Hepatitis B (HBV), a virus that causes serious and sometimes fatal liver disease.

c. Special precautions must be followed to protect you when giving first aid.

- Treat all victims as if they were infected because you cannot tell by looking at someone if they are infected with HIV or HBV.
- Always wear latex or vinyl rubber gloves as a barrier. These should be included in every first aid kit. If latex gloves are not available, use the most waterproof material available (such as plastic bags) or extra gauze dressings to form a barrier.

- Cover all wounds with dressings to prevent both the victim and the first aider from coming in contact with each other's blood.
- Use face masks with a one-way valve for protection when doing mouth-to-mouth breathing, especially if there is blood in the mouth. Every first aid kit should have one.
- Do not eat, drink, or touch your mouth, nose, or eyes when giving first aid.

d. Special clean-up procedures must also be followed.

- Vigorously wash your skin in hot, soapy water, and rinse well.
- Notify designated personnel in your facility to clean up any materials or surfaces contaminated by blood or body fluids. They will:
  - Wash all clothing and other items contaminated by blood or body fluids in hot, soapy water.
  - Wash floors and other blood-contaminated surfaces with a solution of one part liquid chlorine bleach to nine parts of water, and rinse well.
  - Dispose of cleanup materials properly in plastic biohazard bags. Any sharp materials such as broken glass, razor blades, etc. must be disposed of in a properly labeled puncture-proof container.

Note: If you have other questions, call the national AIDS hot line at 1-800-342-AIDS.

Objective 18

Guidelines for lifting and carrying items safely

a. Before lifting

- Inspect the item to be lifted for jagged edges, splinters, grease, or other slippery surfaces.
- Wear gloves for protection.
- Wear lower back support.

  Example: Leather lower back support belt
- Plan your route before you lift.
- Clear any obstacles from your path.
- Assess the weight of the load.
- Get help for heavy loads.

b. Lifting

- Place your feet as close to the load as possible, one foot alongside the load and the other behind it.
- Bend your knees, keeping your back and neck straight and your chin tucked in.
- Grasp the load firmly with your fingers and hands.
- Draw your arms in close to your body.
- Stand slowly and lift smoothly, using your legs.

c. Carrying

- Hold items close to your body.
- Do not allow load to block your vision.
- Do not change your grip or twist your body to change direction.

  Note: Twisting the back while carrying a load (even a small one) can result in severe back injury.

d. Setting down the load

- Bend your knees.
- Keep your back and neck straight and aligned.
- Place load carefully where you want it, taking care not to allow it to rest on your feet or fingers.

Student Supplement 1—Guidelines for Interpreting Material Safety Data Sheets

Living in the modern world, you probably are aware that the use of chemicals offers convenience and progress at home and work. Naturally, you want to avoid dangerous overexposure to chemicals, especially on the job. Such overexposure is possible no matter where you work.

Your company's hazard communications, or HazCom, program was created to protect your health and safety. Three important elements are at the heart of your HazCom program: warning labels on containers, training on the safe use and handling of chemicals, and material safety data sheets (MSDSs).

What is on an MSDS

MSDSs are printed pages that give you all the critical information you need about how to use, transport, and store chemicals in order to protect yourself, as well as what to do in case of emergencies and overexposure. Information on MSDSs includes:

- The chemical's name or names
- Name, address, and phone number of the manufacturer
- List of the chemical's ingredients
- Permissible exposure limits (PEL) or threshold limit value (TLV)
- What conditions or other substances will cause the chemical to catch fire, explode, melt, or turn into dangerous gases
- How the chemical usually looks and smells
- How to put out a fire involving the chemical
- What to do if the chemical spills or leaks
- How to prevent dangerous exposure
- Health hazards such as skin irritant or cancer-causing agent
- Symptoms of overexposure
- What to do if you are overexposed
- When the MSDS was prepared

The information for each chemical's MSDS is put together by the manufacturer or distributor for that chemical. The sheets often look different from each other, but they still provide the same information. The law requires your employer to keep MSDSs up to date and to send the MSDS to your doctor or designated representative if you request it.

Where the MSDS is kept

MSDSs must be readily accessible to employees—a posted sign may tell you where, and you can also find out by reading your company's written HazCom program. If you are not sure where to find MSDSs, your supervisor or your company's HazCom contact will make them available to you. It is the law.

Student Supplement 1

When to read an MSDS

You should always read the MSDS *before* you begin a job using a chemical. Even if you have used the chemical before, the manufacturer may have changed its formula, which may change the steps you should take to protect yourself. Taking proper precautions listed on the MSDS, such as wearing a respirator, can prevent serious long-term illnesses.

If you do not understand something on the MSDS, or have questions about your company's HazCom program, ask your supervisor or company contact. Your company knows that HazCom works best if you are fully informed and involved.

How to read an MSDS

The material safety data sheet, or MSDS, is written information that can help protect you from overexposure to chemicals you find on the job. The MSDS is part of your company's hazard communications program. Each company can design its own MSDS form, and the sections may be in a different order. But the basic kinds of information on any MSDS will be the same.

Chemical name (see Figure 1). Lists the identity of the substance (the name on the label, date the MSDS was prepared, the name and address of the manufacturer, and usually a phone number for emergencies and more information).

Hazardous ingredients/chemical identity (see Figure 1). Includes names of substances in the chemical that might be dangerous, and lists safety exposure limits such as permissible exposure limit or PEL (set by OSHA) or the threshold limit value or TLV. Also lists common names for the chemical.

Physical characteristics (see Figure 1). Describes many physical qualities of the chemical, and lets you know what is usual or safe. For example, how the chemical looks and smells;

Figure 1

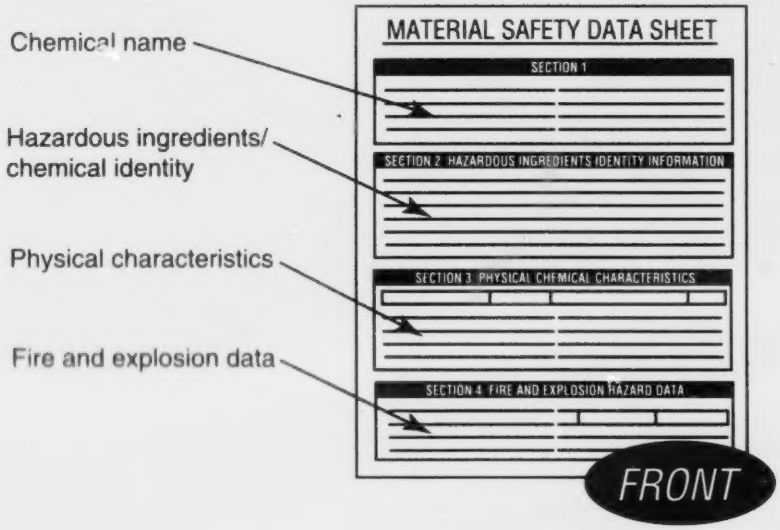
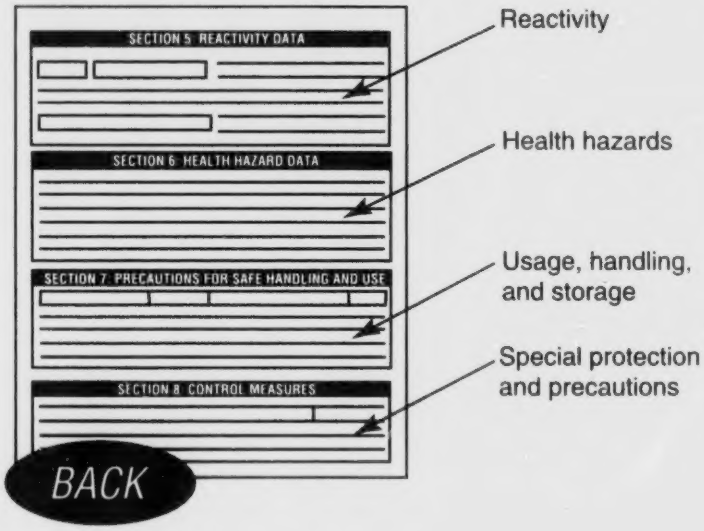

Chemical name
Hazardous ingredients/ chemical identity
Physical characteristics
Fire and explosion data
MATERIAL SAFETY DATA SHEET
SECTION 1
SECTION 2 HAZARDOUS INGREDIENTS IDENTITY INFORMATION
SECTION 3 PHYSICAL CHEMICAL CHARACTERISTICS
SECTION 4 FIRE AND EXPLOSION HAZARD DATA
FRONT

Figure 2


SECTION 5 REACTIVITY DATA
SECTION 6 HEALTH HAZARD DATA
SECTION 7 PRECAUTIONS FOR SAFE HANDLING AND USE
SECTION 8 CONTROL MEASURES
BACK
Reactivity
Health hazards
Usage, handling, and storage
Special protection and precautions

boiling and melting temperatures (important in case a chemical might become a gas you could breathe); evaporation rate (known as percent volatile); how easily the chemical dissolves; and how heavy it is (this tells you if it will sink, float, or dissolve in water).

Fire and explosion data (see Figure 1). Tells you the lowest temperature at which the chemical could catch fire (flash point). Lets you know if it is flammable (catches fire below 100°F) or combustible (catches fire above 100°F). Lists the best way to put out a fire involving that chemical.

Reactivity (see Figure 2). Describes what happens if this chemical comes in contact with air, water, or other chemicals. Describes conditions (like heat) or materials (like water) that can cause the chemical to react by burning, exploding, or releasing dangerous vapors. The chemical is called "incompatible" or "unstable" with these conditions or substances.

Health hazards (see Figure 2). Lists ways the chemical might enter your body, like splashing on your skin or being breathed in as vapor, as well as possible symptoms of overexposure. Lets you know if overexposure might make existing medical conditions worse, and describes emergency first aid procedures.

Usage, handling, and storage (see Figure 2). Describes how to clean up an accidental spill, leak, or release, including special procedures. Tells you how to handle, store, and dispose of chemicals safely. Remember, if there is an accident, notify your supervisor immediately. Take care of it yourself only if you are trained to do so and are wearing the proper equipment.

Special protection and precautions (see Figure 2). Explains special personal protective equipment (PPE) and other equipment to use when working with the chemical, special procedures, extra health or safety information, signs that should be posted, and other information not covered in other sections.

Student Supplement 1

Terms and abbreviations used on MSDSs

The following terms and abbreviations will help you interpret material safety data sheets.

- **TLV**—Threshold limit value; a time-weighted average concentration *under which* most people can work consistently for 8 hours a day, day after day with no harmful effects
- **Ceiling**—Uppermost limit
- **ACGIH**—American Conference of Governmental Industrial Hygienists
- **OSHA**—Occupational Safety and Health Administration
- **PEL**—Permissible exposure limit; the maximum time-weighted concentration *at which* 95 percent of exposed, healthy adults suffer no adverse effects over a 40-hour week
- **ppm**—Parts per million
- **STEL**—Short-time exposure limit; a 15-minute, time-weighted average that should not be exceeded at any time during a workday. Exposures at STEL should not be longer than 15 minutes and should not be repeated more than four times a day with at least 60 minutes between exposures.
- **IDLH**—Immediately dangerous to life and health; material *at* or *above* this level poses an immediate hazard to life or produces immediate, irreversible, debilitating effects
- **LEL**—Lower explosive limit; below the flammability range (too lean to burn)
- **UEL**—Upper explosive limit; above the flammability range (too rich to burn)

© 1988 Parlay International.

Objective 19

Assignment Sheet 1—Complete a Student Safety Pledge Form

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Student completed safety pledge form	______

Basic Skills

Reading Employability

______________________, who is enrolled in Vocational ______________________, will, as a part of his/her shop experience, operate machines, providing that the parent or guardian gives written permission.

It is important that each student be given proper instruction, both in the use of the equipment and in the correct safety procedures concerning it, before being allowed to operate it. The student must assume responsibility for following safe practices, and we therefore ask that the student subscribe to the following safety pledge.

1. I promise to follow all safety rules for the shop.
2. I promise never to use a machine without first having permission from the instructor.
3. I will not ask permission to use a particular machine unless I have been instructed in its use, and have scored 100% on the safety test for that machine.
4. I will report any accident or injury to the teacher immediately.

Date ______________ Student's signature ______________________

I hereby give my consent to allow my son or daughter to operate all machines and equipment necessary in carrying out the requirements of the course in which he/she is enrolled.

Date ______________ Parent's signature ______________________

Parents are cordially invited to visit the shop to inspect the machines and to see them in operation.

Objective 20

Assignment Sheet 2—Survey the Shop and Identify Correct Safety Practices

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Student participated in shop survey	______
• Questionnaire was completed	______
• Questions answered correctly	______
• Proper teamwork was utilized by the group to complete survey	______

Basic Skills

Reading Writing Oral Communication Interpersonal Critical Thinking

Introduction

In this unit you will be introduced to proper shop safety practices. An important part of shop safety is a safe work environment. In this assignment you will explore your shop and evaluate the shop's safety.

Directions

Form a group of two to three students. As a team, inspect each area of your shop carefully and answer the following questions.

1. What safety practices are used in your shop to promote general safety?

____

____

____

2. What practices are used to maintain an orderly shop? __________

____

____

____

3. Are warnings and cautions posted? If so, where? __________

____

____

4. Where is the emergency eye wash station? ____________________

5. Where is your shop fire extinguisher located; what type is it; and on what kinds of fires may it be used? ____________________

6. Where is your shop first aid kit located? Who is permitted to use it?

7. What equipment and machines in your shop must you run separate safety tests on before you are allowed to operate them? __________

8. Are the guards in place on all equipment? Where are the emergency cutoff switches located? ____________________

9. What personal safety protection devices or clothing must you wear while working in the shop? ____________________

322

10. What procedure should you follow if you see an accident happen?

11. Are chemicals stored properly? Are areas where chemicals are used properly ventilated? Are MSDS sheets available for chemicals used in shop?

12. What procedure should you follow to dispose of chemicals?

Objective 21

Assignment Sheet 3—Interpret a Material Safety Data Sheet

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Student participated in assignment	______
• Student answered questions correctly	______
• Assignment was neat and completed on time	______

Basic Skills

Reading Writing Critical Thinking

Materials list

- Objective 6
- Student Supplement 1

Directions

Review the material in Objective 6 of the information sheet, and locate and study the information presented in Student Supplement 1, "Guidelines for Interpreting Material Safety Data Sheets."

Use the MSDS at the end of this assignment sheet to answer the following questions. Write your answers on the blanks provided.

1. What is the name of the substance? ______________________

   ____

2. What potentially hazardous ingredients does it contain?

   ____

   ____

3. What possible injury could occur from external contact?

   ____

4. Is this substance heavier or lighter than water? ______________

5. What is its boiling range? ______________________

6. What is its OSHA flammability classification? ____________________

7. How should first aid for eye contact be administered? ____________________

____

____

8. Is this a stable product? ____________________

9. What kind of protective equipment should be used when handling this substance? ____________________

____

____

10. What instructions are given for handling and storage of this substance?

____

____

Assignment Sheet 3

MATERIAL SAFETY DATA SHEET
FOR PRINTING INK AND RELATED MATERIALS

Information on this form is proprietary information
solely for the use of our customers

DATE OF PREP. 11-25-85 PREPARED BY S. L. MAKI

HAZARD RATINGS
Minimal.....0
Slight........ 1
Moderate.. 2
Severe......4

HEALTH	3
FLAMMABILITY	0
REACTIVITY	0

SECTION I

MANUFACTURER'S NAME Flint Ink Corporation
STREET ADDRESS 25111 Glendale Avenue
CITY, STATE AND ZIP CODE Detroit, MI 48239-2689
EMERGENCY TELEPHONE NUMBER (313) 538-6800
PRODUCT CLASS Fountain Solution
TRADE NAME MIRACLE "V-2020" CONCENTRATE
MANUFACTURER'S CODE IDENTIFICATION UW-W-35, UW-W020

Section II — HAZARDOUS INGREDIENTS

Ingredient	Hazard Data
Ethylene Glycol	TLV-Vapor 50ppm. Vapor & mist may cause irritation to the eyes. Ingestion may cause central nervous system depression and also can cause liver or kidney damage.
Alkaline Phosphates & Silicates	Eye & skin irritation.

Section III — PHYSICAL DATA

BOILING RANGE F 215-220	VAPOR DENSITY vs. air HEAVIER X LIGHTER	LIQUID DENSITY vs. water HEAVIER X LIGHTER	TYPE OF ODOR Antifreeze
APPEARANCE Liquid	EVAPORATION RATE vs. Butyl Acetate FASTER SLOWER X	PERCENT VOLATILE WT. 85-90%	

Section IV — FIRE & EXPLOSION DATA

FLAMMABILITY CLASSIFICATION OSHA Class IIIB
FLASH POINT °F Greater than 200°F
LEL 3.2% for Ethylene Glycol
DOT Not regulated (Method Used) T.C.C.

EXTINGUISHING MEDIA

X FOAM X ALCOHOL FOAM X CO2 X DRY CHEMICAL X WATER FOG X OTHER

UNUSUAL FIRE AND EXPLOSION HAZARDS
No fire hazard; nonflammable.

SPECIAL FIREFIGHTING PROCEDURES
Water may be used to cool containers to prevent pressure build-up.

SECTION V — HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE

This material is an eye irritant. Prolonged or repeated contact with skin will cause irritation; very alkaline. DO NOT INGEST.

PRIMARY ROUTE(S) OF ENTRY: X DERMAL X INHALATION

EMERGENCY AND FIRST AID PROCEDURES Eye contact: Flush immediately with large amounts of water for at least 15 minutes. Contact physician. Skin contact: Wash affected areas with soap & water. Remove contaminated clothing. Ingestion: Drink 1 or 2 glasses of water to dilute. DO NOT INDUCE VOMITING. Contact physician; treat symptomatically.

Section VI — REACTIVITY DATA

PRODUCT STABILITY X STABLE __ UNSTABLE

CONDITIONS TO AVOID
Contact with strong oxidizers.

SECTION VII — SPILL OR LEAK PROCEDURES

PROCEDURE WHEN MATERIAL SPILLED OR RELEASED
Flush area with water. Wipe up and dispose of in approved containers.

WASTE DISPOSAL METHOD
In accordance with local, state and federal regulations.

Section VIII — SPECIAL PROTECTION INFORMATION

VENTILATION Normal for work area.

PROTECTIVE GLOVES Recommended

RESPIRATORY PROTECTION Not normally required with adequate ventilation.

EYE PROTECTION Recommended

OTHER PROTECTIVE EQUIPMENT None

Section IX — SPECIAL PRECAUTIONS

HANDLING AND STORING

Keep containers closed when not in use.

OTHER PRECAUTIONS

For industrial use only.

THIS FORM IS AN INDUSTRY SERVICE BY THE NATIONAL ASSOCIATION OF PRINTING INK MANUFACTURERS, INC.
(Information on this form is supplied by the individual ink manufacturer)

NAPIM 4-35

327

Objective 22

Assignment Sheet 4—Draw a Floor Plan and Locate Safety Equipment in Your Shop

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Student followed directions	______
• Student's floor plan accurately represented the shop	______
• All nine locations were correctly labeled and identified	______
• Drawing is neat and labels are legible	______

Basic Skills

Reading Writing

Materials list

- Paper
- Pencil

Directions

On a separate piece of paper, sketch a floor plan of your shop; make it large enough to provide the space to indicate the location of all of the following:

1. Indicate the location of all emergency exits and label those locations **EE**.
2. Indicate where all fire extinguishers are located and label those locations **FE**.
3. Indicate where the eye wash station is located and label that location **EW**.
4. Indicate where the nearest telephone is located and label the location **T**, and beside it write the emergency telephone number.
5. Indicate where the first aid kit is located and label the location **First Aid**.
6. Indicate the reassembly point following a fire drill and show its approximate location with respect to the shop by labeling the location **RP**.
7. Indicate the safe shelter for severe weather and show its approximate location with respect to the shop by labeling the location **Safe Shelter**.
8. Indicate the location of the solvent disposal area and label the location **Solvents**.
9. Indicate the location of the combustible storage area and label the area **CS**.

Objective 23

Job Sheet 1—Operate a Fire Extinguisher

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Extinguisher was carried properly	______
• User was within stream reach of fire	______
• P-A-S-S sequence was followed	______
• Fire was completely extinguished	______

Basic Skills

Reading Employability

Introduction

Using a portable fire extinguisher properly requires more than simple manipulation. You must always size up the fire and decide whether it can be extinguished with an extinguisher. If the fire is too large or too smoky, call the fire department. If the fire is small enough to be extinguished with an extinguisher, always fight it with your back to a means of escape.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- Portable fire extinguisher suitable for a class A fire
- Small class A fire in clear, safe area
- Charged hose (hose hooked up to a water source and with water in the hose) or another secondary means of extinguishment for backup

> **Caution:** This procedure should only be performed outdoors on a windless day and only under the direct supervision of your instructor.

Procedure

☐ 1. Pick up the fire extinguisher by its handle.

Note: All modern fire extinguishers are designed to be used in an upright position.

☐ 2. Read the fire extinguisher label to determine proper stream reach.

Note: *Stream reach* is the distance the extinguishing agent is propelled. Stream reach varies with extinguisher, and may range from 3 to over 20 feet. Normally, the smaller the extinguisher, the shorter the stream reach.

☐ 3. Walk—do not run—to within stream reach of the fire.

☐ 4. **Pull** the pin at the top of the extinguisher that keeps the handle from being pressed.

Note: Pulling the pin automatically breaks the plastic or thin wire inspection band.

☐ 5. **Aim** the nozzle toward the fire, first releasing it from its clip if applicable.

☐ 6. **Squeeze** the discharge handle (above the carrying handle) to release the extinguishing agent.

Note: The discharge handle can be released at any time to stop the discharge.

☐ 7. **Sweep** the nozzle back and forth at the base of the flames.

☐ 8. After the fire appears to be out, probe for remaining hot spots.

☐ 9. Make sure the fire is out by extinguishing any hot spots.

Evaluator's Comments: ____________________

____

____

Objective 24

Job Sheet 2—Lift a Heavy Object Properly

Name ____________________ Attempt Number ________

Date ____________________ Overall Rating ________

Evaluation Criteria	Rating
• Support belt was worn	______
• Load was lifted safely	______
• Load was carried and set down safely	______

Basic Skills

Reading

Critical Thinking

Introduction

The number-one worker injury in America today is back strain or injury. Most of these injuries come from trying to lift an object that is too heavy or from lifting an object improperly. It is very important, therefore, that you learn to assess the weight of a load to be lifted, and either get help to lift the load or lift the load properly, using your leg muscles, not your back.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- Large, heavy box
- Gloves
- Lower-back support belt

Procedure

☐ 1. Put on gloves and lower-back support belt.

☐ 2. Size up the load.

☐ 3. Place your feet close to the object and 8 to 12 inches apart for good balance.

☐ 4. Bend your knees to a degree that is comfortable.

☐ 5. Grip the box firmly with both hands.

☐ 6. Keeping your back straight and using your leg muscles, lift the box to waist height and hold close to your body.

Caution: Do not make any turning or twisting motions until the lift is complete.

☐ 7. Turn by changing foot position, making sure that your path is clear.

☐ 8 Carry the box to the new location, using a normal walking gait and keeping your view unobstructed.

☐ 9. Reverse the lifting procedure to set the box down, taking care to bend your knees, keep your back straight, and avoid setting the box on your fingers or feet.

Evaluator's Comments: ____

____

____

Unit Contents

Student Components

Student Page

Objective Sheet 3-3

Information Sheet 3-5

Assignment Sheets

1—Add Whole Numbers 3-27
2—Subtract Whole Numbers 3-31
3—Multiply Whole Numbers 3-35
4—Divide Whole Numbers 3-39
5—Reduce Fractions to Lowest Terms 3-43
6—Convert Fractions and Mixed Numbers 3-45
7—Add Fractions 3-47
8—Subtract Fractions 3-51
9—Multiply Fractions 3-57
10—Add Decimal Numbers 3-59
11—Subtract Decimal Numbers 3-63
12—Multiply Decimal Numbers 3-67
13—Divide Decimal Numbers 3-71
14—Convert Fractions and Percentages 3-75
15—Solve Percentage Problems 3-79
16—Read a U.S. Customary Rule 3-83

Objective Sheet

Unit Objective

After completing this unit, the student should be able to solve basic math problems and read a U.S. customary rule. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms associated with math and measuring to their definitions.
2. Match symbols used in basic math with their names.
3. Label the place values of a whole number.
4. Add whole numbers to solve problems.
5. Subtract whole numbers to solve problems.
6. Multiply whole numbers to solve problems.
7. Divide whole numbers to solve problems.
8. Distinguish among types of fractions.
9. Reduce fractions to lowest terms.
10. Convert fractions and mixed numbers.
11. Add fractions to solve problems.
12. Subtract fractions to solve problems.
13. Multiply fractions to solve problems.
14. Label place values in a decimal number.
15. Add decimal numbers to solve problems.
16. Subtract decimal numbers to solve problems.
17. Multiply decimal numbers to solve problems.
18. Divide decimal numbers to solve problems.
19. Convert fractions and percentages.
20. Solve percentage problems.
21. Add whole numbers. (Assignment Sheet 1)

22. Subtract whole numbers. (Assignment Sheet 2)
23. Multiply whole numbers. (Assignment Sheet 3)
24. Divide whole numbers. (Assignment Sheet 4)
25. Reduce fractions to lowest terms. (Assignment Sheet 5)
26. Convert fractions and mixed numbers. (Assignment Sheet 6)
27. Add fractions. (Assignment Sheet 7)
28. Subtract fractions. (Assignment Sheet 8)
29. Multiply fractions. (Assignment Sheet 9)
30. Add decimal numbers. (Assignment Sheet 10)
31. Subtract decimal numbers. (Assignment Sheet 11)
32. Multiply decimal numbers. (Assignment Sheet 12)
33. Divide decimal numbers. (Assignment Sheet 13)
34. Convert fractions and percentages. (Assignment Sheet 14)
35. Solve percentage problems. (Assignment Sheet 15)
36. Read a U.S. customary rule. (Assignment Sheet 16)

Information Sheet

Objective 1

Terms and definitions associated with math and measuring

a. **Whole number (integer)**—Any of the natural numbers, both positive and negative, that represents a complete item

Example: 25 is a whole number as opposed to 3/4, a fraction or part of a whole.

b. **Digit**—Any one of the ten symbols, 0 to 9, by which all numbers can be expressed

c. **Fraction**—Part of a whole; represents one or more equal parts of a unit

Examples:

Figure 1

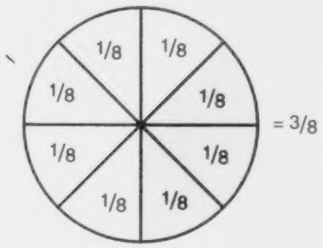
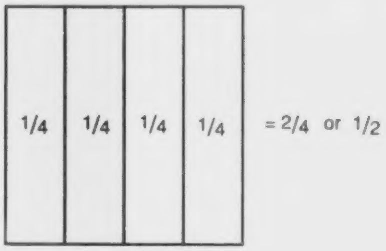


Figure 2



d. **Decimal**—Fraction with an unwritten denominator of 10 or some power of 10; indicated with a point before the number

Examples: 0.1 = 1/10 0.06 = 6/100 0.003 = 3/1000

e. **Addition**—Process of totaling two or more numbers to find another number called a sum

Examples: 3 + 5 + 9 = 17

f. **Subtraction**—Opposite operation of addition

Examples: 8 − 4 = 4 as opposed to 4 + 4 = 8

g. **Multiplication**—Abbreviated process of adding a number to itself a specified number of times

Examples: 6 x 3 = 18 as opposed to 6 + 6 + 6 = 18

h. **Division**—Opposite operation of multiplication

Example: 16 ÷ 2 = 8 as opposed to 8 x 2 = 16

i. **Percent**—One part in a hundred; reckoned on the basis of a whole divided into one hundred parts

j. **Ratio**—Relationship in quantity, amount, or size between two or more things

k. **Proportional**—Being relatively equal in size or quantity

Example: 1:1:3 = 0.5:0.5:1.5

l. **Meter**—Metric unit used to measure length

m. **Liter**—Metric unit used to measure capacity

Objective 2

Interpretations of symbols used in math problems

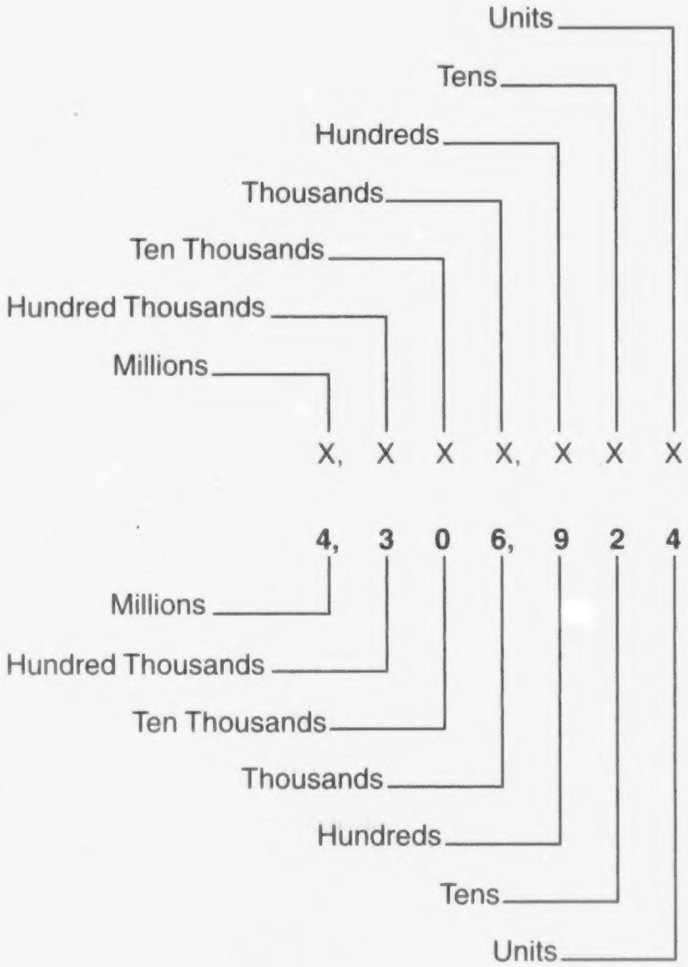
Plus sign (addition)	+
Minus sign (subtraction)	−
Times sign (multiplication)	X
Division sign	÷
Division frame	⟌
Equal sign	=
Decimal point	.
Percent symbol	%
Ratio symbol	:

Objective 3

Place values of whole number

Note: The position of a digit in a number shows how much that digit is worth. These positions are called *place values.*

Example:


Units
Tens
Hundreds
Thousands
Ten Thousands
Hundred Thousands
Millions
X, X X X, X X X
4, 3 0 6, 9 2 4
Millions
Hundred Thousands
Ten Thousands
Thousands
Hundreds
Tens
Units

Note: The number in this example is four million, three hundred six thousand, nine hundred twenty-four.

Information Sheet

Objective 4

Adding whole numbers

a. Set up problem by writing units under units, tens under tens, and so on.

Example: Add whole number 1632, 17, 550.

$$\begin{array}{r}1632\\17\\\underline{+\,550}\end{array}$$

b. Add each column separately, beginning at top of units column.

Example:

$$\begin{array}{r}1632\\17\\\underline{+\,550}\\9\end{array}\qquad\begin{array}{r}1632\\17\\\underline{+\,550}\\99\end{array}$$

c. If the sum of any column is two or more digits, write the units digit in your answer and carry the remaining digit(s) to the top of next column to the left.

Example:

$$\begin{array}{lrrl} & & \mathbf{1} & \longleftarrow \text{Carry remaining digit.}\\ & 1632 & 1632 & \\ & 17 & 17 & \\ \text{Write units} & \underline{+\,550} & \underline{+\,550} & \\ \text{digit} \longrightarrow & 199 & 199 & \end{array}$$

d. Add any carried digit(s) above the column with that column.

Example:

$$\begin{array}{rl}\mathbf{1} & \text{Carried Digit}\\1632 & \\17 & \\\underline{+\,550} & \\2199 & \end{array}$$

Objective 5

Subtracting whole numbers

a. Set up problem by writing units under units, tens under tens, and so on.

Note: Top number in the problem (original number is almost always larger than the bottom number [subtracted number]).

Example: Subtract 91 from 123.

$$\begin{array}{rl}123 & \text{Original number}\\\underline{-\,91} & \text{Subtracted number}\end{array}$$

b. Subtract each column separately, beginning at bottom of units column.

Example:

$$\begin{array}{r} 123 \\ \underline{-\ 91} \\ 2 \end{array} \uparrow$$

c. If a digit in the subtracted number is larger than the digit above it, "borrow" 1 from the top digit in the next column to the left, decreasing that digit by one and increasing the digit being subtracted by ten.

Example:

$$\begin{array}{r} 123 \\ \underline{-\ 91} \\ 32 \end{array}$$

d. If there is nothing to borrow in the next column (column contains a zero), first borrow for that column from its next left column.

Example:

$$\begin{array}{r} 906 \\ \underline{-\ 318} \\ \end{array} \qquad \begin{array}{r} 906 \\ \underline{-\ 318} \\ 8 \end{array} \qquad \begin{array}{r} 906 \\ \underline{-\ 318} \\ 88 \end{array} \qquad \begin{array}{r} 906 \\ \underline{-\ 318} \\ 588 \end{array}$$

e. Check your subtraction by adding your answer to the subtracted number.

Example:

Problem		Check	
271	Original number	271	Original number
$\underline{-\ 164}$ $\uparrow$	Subtracted number	$\underline{-164}$	
107	Answer	$\underline{+\ 107}$	
		271	Check answer

Note: If you have solved the problem correctly, your check answer should be the same as the original number.

Objective 6

Multiplying whole numbers

a. Set up problem by writing larger number (original number) above the smaller number (multiplier), writing units under units, tens under tens, and so on.

Note: You will get the correct answer (product) no matter which number is placed above the other, but the faster method places the larger above the smaller.

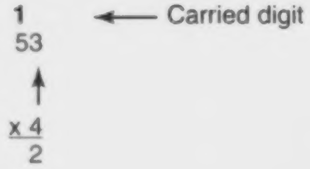
Example: Multiply the numbers 53 and 4.

$$\begin{array}{rl} 53 & \text{Original number} \\ \underline{\times\ 4} & \text{Multiplier} \end{array}$$

b. If the multiplier contains only one digit, multiply each digit in the original number by it, working from right to left.

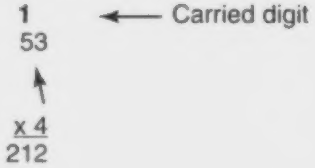
- Multiply units digit in original number by multiplier.
- Write answer units digit and insert necessary carry digit above next left column in original number as required.

Example:


1
Carried digit
53
x 4
2

- Multiply tens digit by multiplier and add carried digit as required.

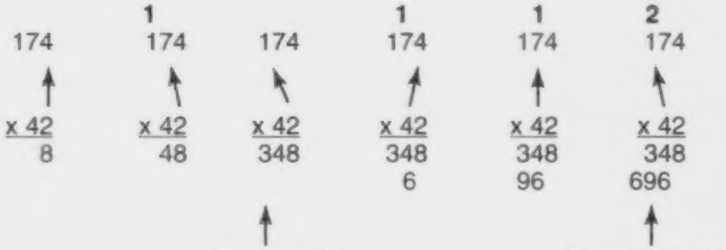
Example:


1
Carried digit
53
x 4
212

c. If the multiplier contains more than one digit, find partial products.

- Multiply each digit in original number by each digit in multiplier, moving from right to left.
- Align partial products so that right-hand digit of each is directly under its corresponding digit in the multiplier.

Example: Multiply the numbers 174 x 42.


174
x 42
8
1
174
x 42
48
174
x 42
348
1
174
x 42
348
6
1
174
x 42
348
96
2
174
x 42
348
696

First partial product

Second partial product

d. Add the partial products.

Example:

$$\begin{array}{r} 174 \\ \underline{\times\ 42} \\ 348 \\ \underline{+\ 696} \\ 7308 \end{array}$$

Answer (product)

Objective 7

Dividing whole numbers

a. Set up problem by writing original number (number to be divided) inside a division frame, and by writing divisor (number you are dividing by) outside frame.

Example: How many times will 34 go into 3347?

Divisor $34\overline{)3347}$ Original Number

b. Determine how many times the divisor will go into the first digit of the original number. If it will not, write a zero in the answer space directly above the first digit. Then determine how many times the divisor will go into the first two numbers of the original number.

Note: Continue trying to divide the original number by the divisor until a set of digits can be divided. Remember to write a zero each time the set of digits cannot be divided.

Example:

$$\begin{array}{r} 0 \\ 34\overline{)3347} \end{array}$$

34 goes into 3 zero times.

$$\begin{array}{r} 00 \\ 34\overline{)3347} \end{array}$$

34 goes into 33 zero times.

$$\begin{array}{r} 009 \\ 34\overline{)3347} \end{array}$$

34 goes into 334 nine times.

c. Multiply the divisor by the answer (digit above frame); write this answer under the digit(s) that divisor went into, and subtract.

Example:

$$\begin{array}{r} 34 \\ \underline{\times\ 9} \\ 306 \end{array}$$

Multiply divisor (34) by answer (9).

$$\begin{array}{r} 009 \\ 34\overline{)3347} \\ \underline{-\ 306} \\ 28 \end{array}$$

d. Bring down next unused digit from original number, and place it to the right of the subtracted difference (remainder)—even if the remainder is zero.

Example:

$$\begin{array}{rl} & 009 \\ 34 & \overline{)3347} \\ & \underline{306}\downarrow \\ & \ \ 287 \end{array}$$

e. Determine how many times the divisor will go into this new number; write your answer in the answer space above the digit that was brought down.

Example

$$\begin{array}{rl} & 0098 \\ 34 & \overline{)3347} \\ & \underline{306\ } \\ & \ \ 287 \end{array}$$

f. Multiply the divisor by the last digit you wrote in the answer; write this product under the digits that divisor went into, and subtract.

Example:

$$\begin{array}{r} 34 \\ \underline{\times 8} \\ 272 \end{array}$$

Multiply divisor (34) by answer (8).

$$\begin{array}{rl} & 0098 \\ 34 & \overline{)3347} \\ & \underline{306\ } \\ & \ \ 287 \\ & \underline{-272} \\ & \ \ \ 15 \end{array}$$

Write product under 287, the digits that divisor went into, and subtract.

g. Continue this process until all numbers in original number are used.

h. Write any remaining subtracted difference as a remainder.

Example:

$$\begin{array}{rl} & 0098 \\ 34 & \overline{)3347} \\ & \underline{306\ } \\ & \ \ 287 \\ & \underline{-272} \\ & \ \ \ 15 \end{array}$$

Remainder

i. Check your answer by multiplying your answer times the divisor and adding the remainder to this number.

Note: If you have solved the problem correctly, your check answer should be the same as your original number.

Example:

Example:	98	Answer
	x 34	Divisor
	392	
	294	
	3332	
	+ 15	Remainder
	3347	Check answer (Same as original number)

Objective 8

Distinguishing among types of fractions

a. **Proper**—Top number of fraction (numerator) is smaller than bottom number of fraction (denominator).

Example: $\begin{matrix} 7 & \text{Numerator} \\ \overline{8} & \text{Denominator} \end{matrix}$

b. **Improper**—Top number of fraction (numerator) is larger than bottom number of fraction (denominator) or the same as the bottom number.

Examples: $\frac{9}{8}$ $\frac{16}{16}$

c. **Mixed numbers**—Contain a whole number and a proper fraction.

Examples: $9\ {}^{1}/_{2}$, $1\ {}^{7}/_{8}$, $4\ {}^{3}/_{4}$

Objective 9

Reducing fractions to lowest terms—Divide the numerator and denominator by the largest whole number that will go into each evenly.

Example: Reduce ${}^{4}/_{16}$ to its lowest terms.

$$\frac{4}{16} = \frac{4 \div 4}{16 \div 4} = \frac{1}{4}$$

Note: The fraction ${}^{1}/_{4}$ is reduced to its lowest term because the numerator (1) and the denominator (4) cannot be divided by the same number.

Objective 10

Converting mixed numbers and improper fractions

a. Converting mixed numbers to improper fractions

- Multiply the whole number by the denominator of the fraction.

  Example: Convert 4 $^3/_8$ to an improper fraction.

  $8 \times 4 = 32$

- Add your answer to the numerator.

  Example: $32 + 3 = 35$

- Place this sum over the original denominator.

  Example: $\frac{35}{8}$ Improper fraction

b. Converting improper fractions to mixed numbers

- Divide the numerator by the denominator.

  Example: Convert $^{18}/_{15}$ to a mixed number.

  $$\begin{array}{r} 01 \\ 15\overline{)18} \\ \underline{15} \\ 3 \end{array} \quad \text{Remainder}$$

- Place the remainder over the denominator.

  Example: $\frac{3}{15}$ $\begin{array}{l}\text{Remainder} \\ \text{Denominator}\end{array}$

- Reduce this fraction if necessary.

  Example: $\frac{3}{15} = \frac{3 \div 3}{15 \div 3} = \frac{1}{5}$

- Add the reduced fraction to the whole number obtained by dividing the numerator by the denominator.

  Example: $1 + \frac{1}{5} = 1\frac{1}{5}$ Mixed number

Objective 11

Adding fractions

a. Like fractions

Note: Like fractions are those having the same, or common, denominators.

Example: $^1/_4$ and $^2/_4$, $^5/_8$ and $^5/_8$, and $^1/_{16}$ and $^3/_{16}$

- Add the numerators.
- Place sum of numerators over common denominator.
- Convert to mixed numbers and reduce as required.

Example: Add $^1/_4$ and $^2/_4$.

$$\frac{1}{4} + \frac{2}{4} = \frac{1+2}{4} = \frac{3}{4}$$

Example: Add $^5/_8$ and $^5/_8$.

$$\frac{5}{8} + \frac{5}{8} = \frac{5+5}{8} = \frac{10}{8} = 10 \div 8 = 1\frac{2}{8} = 1\frac{1}{4}$$

Example: Add $^1/_{16}$ and $^3/_{16}$.

$$\frac{1}{16} + \frac{3}{16} = \frac{1+3}{16} = \frac{4}{16} = \frac{4 \div 4}{16 \div 4} = \frac{1}{4}$$

b. Unlike fractions

Examples: $^{11}/_{12}$ and $^3/_9$, $^1/_8$ and $^3/_4$

- Change to like fractions.
  - Find the lowest number into which each denominator can be divided evenly (lowest common denominator).

- Multiply the numerators and denominators of each fraction by the number of times its denominator can be divided into the lowest common denominator.

Example: Add $^{11}/_{12}$ and $^{3}/_{9}$.

36 is lowest number into which both 12 and 9 can be divided evenly.

$36 \div 12 = 3$

$36 \div 9 = 4$

$\frac{11}{12} = \frac{11 \times 3}{12 \times 3} = \frac{33}{36}$

$\frac{3}{9} = \frac{3 \times 4}{9 \times 4} = \frac{12}{36}$

Example: Add $^{1}/_{8}$ and $^{3}/_{4}$.

8 is lowest number into which both 8 and 4 can be divided evenly.

$8 \div 8 = 1$

$8 \div 4 = 2$

$^{1}/_{8}$ remains as $^{1}/_{8}$ because 8 is the common denominator.

$\frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}$

- Add like fractions and reduce or convert to mixed numbers as required.

Example: Add $^{11}/_{12}$ and $^{3}/_{9}$

$\frac{11}{12} = \frac{33}{36}$ and $\frac{3}{9} = \frac{12}{36}$

$\frac{33}{36} + \frac{12}{36} = \frac{33 + 12}{36} = \frac{45}{36} = \frac{5}{4} = 1\frac{1}{4}$

Example: Add $^{1}/_{8}$ and $^{3}/_{4}$

$\frac{1}{8}$ remains $\frac{1}{8}$ and $\frac{3}{4} = \frac{6}{8}$

$\frac{1}{8} + \frac{6}{8} = \frac{1 + 6}{8} = \frac{7}{8}$

c. Mixed numbers

- Add whole numbers.
- Add fractions, first finding common denominators if necessary, and reduce or convert to mixed numbers as necessary.
- Add the sums of steps 1 and 2.

Example: Add $3\,{}^{1}/_{8}$ and $7\,{}^{3}/_{8}$

Add whole numbers:

$3 + 7 = 10$

Add fractions and reduce:

$$\frac{1}{8} + \frac{3}{8} = \frac{1 + 3}{8} = \frac{4}{8} = \frac{1}{2}$$

Add the sums of steps 1 and 2:

$$10 + \frac{1}{2} = 10\frac{1}{2}$$

Example: Add $4\,{}^{2}/_{3}$ and $1\,{}^{5}/_{6}$

Add whole numbers:

$4 + 1 = 5$

Find common denominator:

$$\frac{2}{3} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6}$$

Add fractions, convert to mixed number, and reduce:

$$\frac{4}{6} + \frac{5}{6} = \frac{9}{6} = 1\frac{3}{6} = 1\frac{1}{2}$$

Add the sums of steps 1 and 2:

$$5 + 1\frac{1}{2} = 6\frac{1}{2}$$

Information Sheet

Objective 12

Subtracting fractions

a. Like fractions

- Subtract smaller numerator from larger numerator.

  Example: Subtract $^1/_{16}$ from $^7/_{16}$.

  $7 - 1 = 6$

- Place subtraction answer over common denominator.

  Example: $\frac{6}{16}$

- Reduce to lowest terms as required.

  Example: $\frac{6}{16} = \frac{3}{8}$

b. Unlike fractions

- Change to like fractions.

  Example: Subtract $^1/_2$ from $^3/_4$.

  $^3/_4$ remains the same because 4 is the common denominator.

  $$\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$$

- Subtract as for like fractions.

  $$\frac{3}{4} - \frac{2}{4} = \frac{3-2}{4} = \frac{1}{4}$$

- Reduce to lowest terms as required.

c. Mixed numbers

- Convert mixed numbers to like fractions.

  Example: Subtract 3 $^1/_2$ from 5 $^1/_8$.

  $$5\frac{1}{8} - 3\frac{1}{2} =$$

  $$5\frac{1}{8} - 3\frac{4}{8} =$$

- Borrow a one from the original whole number if needed, convert the one to a like fraction, and add it to the smaller fraction.

  Note: This step is needed only if the like fraction in the original number is smaller than the like fraction in the subtracted number.

  Example:

  $$5\frac{1}{8} - 3\frac{4}{8} = (4\frac{8}{8} + \frac{1}{8}) - 3\frac{4}{8}$$

  $$= 4\frac{9}{8} - 3\frac{4}{8}$$

- Subtract whole number from whole number and like fraction from like fraction.

  Example: $4\frac{9}{8} - 3\frac{4}{8} = 1\frac{5}{8}$

Objective 13

Multiplying fractions

a. Convert mixed numbers to improper fractions if necessary.

b. Multiply numerators by numerators and denominators by denominators.

c. Write the product of the numerators over the product of the denominators.

d. Convert improper fractions to mixed numbers and reduce as required.

Example: Multiply 1/2 by 3/4.

$$\frac{1}{2} \times \frac{3}{4} = \frac{1 \times 3}{2 \times 4} = \frac{3}{8}$$

Example: Multiply 1 1/4 by 1/2.

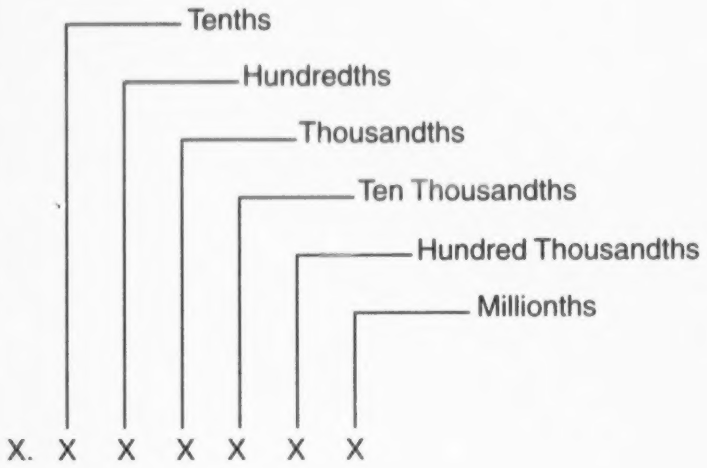
$1\frac{1}{4} \times \frac{5}{4}$ Convert to improper fraction.

$$\frac{5}{4} \times \frac{1}{2} = \frac{5 \times 1}{4 \times 2} = \frac{5}{8}$$

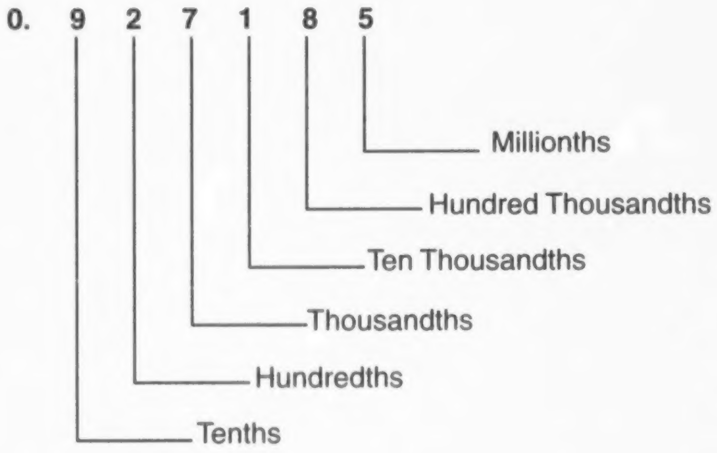
Information Sheet

Objective 14

Place values of decimal numbers


Tenths
Hundredths
Thousandths
Ten Thousandths
Hundred Thousandths
Millionths
X. X X X X X X

Example:


0. 9 2 7 1 8 5
Millionths
Hundred Thousandths
Ten Thousandths
Thousandths
Hundredths
Tenths

Note: The number in the example is read as nine hundred twenty-seven thousandths, one hundred eighty-five millionths.

Objective 15

Adding decimal numbers

a. Set up problem as for addition of whole numbers, aligning decimal points directly under each other.

Note: Zeros may be added to ensure that units line up under units, tens under tens, and so on. Whole numbers have an understood decimal point to the right of the units digit: 7 is 7., 75 is 75., and 754 is 754.

Example: Add 0.857, 2.1, 753, and 370.057.

0.857	000.857
2.1	002.100
753	753.000
+ 370.057	+ 370.057

b. Add each column of numbers as for whole numbers.

c. Locate the decimal point in the answer by placing it directly under the decimal points above.

Example:
000.857
002.100
753.000
+ 370.057
1126.014 Answer

Objective 16

Subtracting decimal numbers

a. Set up problem as for subtraction of whole numbers, aligning decimal points directly under each other.

Example: Subtract 1.397 from 8.120.

8.120	Original number
− 1.397	Subtracted number

b. Subtract each column of numbers as for whole numbers.

c. Locate the decimal point in the answer by placing it directly under the decimal points above.

d. Check your subtraction by adding your answer to the subtracted number.

Note: If you have solved the problem correctly, your check answer should be the same as the original number.

Example:

8.120	Original number
− 1.397	Subtracted number
+ 6.723	Answer (difference)
8.120	Check answer

Information Sheet

Objective 17

Multiplying decimal numbers

a. Set up problem and multiply as for multiplication of whole numbers.

Note: Do **not** align the decimal points in columns when setting up multiplication problems for decimal numbers.

Example: Multiply 27.935 by 7.07.

$$\begin{array}{rl} 27.935 & \text{Original number} \\ \underline{\text{x}\ \ 7.07} & \text{Multiplier} \\ 195545 & \\ \underline{955450} & \\ 19750045 & \end{array}$$

b. Add the number of decimal places to the right of the decimal points in the multiplier and original number.

$$\begin{array}{lrrl} \text{Example:} & 27.935 & 3 & \text{Decimal places} \\ & \underline{\text{x}\ 7.07} & \underline{+\ 2} & \text{Decimal places} \\ & & 5 & \text{Total decimal places} \end{array}$$

c. Locate the decimal point in answer by beginning at far right digit and counting off as many places to the left as the total decimal places found in step b.

$$\begin{array}{lrl} \text{Example:} & 27.935 & \\ & \underline{\text{x}\ \ \ 7.07} & \\ & 195545 & \\ & \underline{1955450} & \\ & 197.50045 & \text{5 decimal places} \end{array}$$

Objective 18

Dividing decimal numbers

a. Set up problem as for division of whole numbers.

Example: Divide 0.25 by 0.005.

Divisor $0.005\overline{)0.25}$ Original number

b. Move the decimal point in the divisor to the right of the far right digit in the divisor.

Example: $0.005.\overline{)0.25}$

353

c. Move the decimal point in the original number to the right by the same number of decimal places that you moved the decimal point in the divisor, adding zeros to the original number if necessary.

Example: $0.005.\overline{)0.250.}$

Note: If you are dividing a decimal number into a whole number, remember that whole numbers have an understood decimal point to the right of the units digit.

Example: $0.03\overline{)9}$ becomes $0.03\overline{)9.00.}$

d. Place a decimal point in the answer space directly above the repositioned decimal point in the original number.

Example: $0.005.\overline{)0.250\overset{.}{.}}$

e. Divide as for whole numbers.

Example:
$$\begin{array}{r} 50. \\ 0005.\overline{)0250.} \\ \underline{025} \\ 00 \end{array}$$

f. Check your division by multiplying the original divisor (before decimal point was moved) by your answer and adding any remainder to this number.

Note: If you have solved the problem correctly, your check answer should be the same as the original number.

Example:	0.005	Divisor
	x 50	Answer
	0.250	Check answer (Same as original number)

Objective 19

Converting fractions and percentages

a. Converting decimal fractions to common fractions

- Remove the decimal point.
- Place number over its respective denominator (10's, 100's, 1000's).
- Cancel zeros when possible.

- Reduce to lowest terms.

Example: Convert .25 to a common fraction

$$.25 = 25$$

$$= \frac{25}{100}$$

$$= \frac{1}{4}$$

Example: Convert .520 to a common fraction

$$.520 = 520$$

$$= \frac{52\cancel{0}}{100\cancel{0}}$$

$$= \frac{52}{100}$$

$$= \frac{13}{25}$$

b. Converting common fractions to decimals and percentages

- Fractions to decimals—Divide the numerator by the denominator.

Example: Convert $^5/_8$ to a decimal.

```
5  Numerator        0.625
8  Denominator    8)5.000
                    4 8
                      20
                      16
                        40
                        40
                         0
```

- Fractions to percentages—Divide the numerator by the denominator.

Note: Percent means that a number is a fraction of 100.

— Convert the fractions to decimals by dividing numerator by denominator.

— Move the decimal point in the answer two places to the right.

— Place the percent symbol after the number.

Example: Convert $^7/_{33}$ to a percentage.

$$\frac{7}{33}\quad\begin{array}{l}\text{Numerator}\\ \text{Denominator}\end{array}\qquad\begin{array}{r} 0.2121 \\ 33\overline{)7.0000} \\ \underline{6\,6} \\ 40 \\ \underline{33} \\ 70 \\ \underline{66} \\ 40 \\ \underline{33} \\ 7 \end{array} = 21.21\%$$

c. Converting percentages to fractions and decimal numbers

- Percentages to fractions

  — Drop the percent symbol.

  — Place the number over 100.

  — Reduce to lowest terms if necessary.

  Example: Convert 38% to a fraction

  $$\begin{aligned} 38\% &= 38 \\ &= \frac{38}{100} \\ &= \frac{19}{50} \end{aligned}$$

- Percentages to decimals

  — Drop the percent symbol.

  — Move the decimal point two places to left.

  Example: Convert 74% to a decimal

  $$\begin{aligned} 74\% &= 74 \\ &= 0.74 \end{aligned}$$

Objective 20

Solving percentage problems

Note: Percentage problems may involve solving for the percent ("16 is what percent of 80?"), the part ("What number is 20% of 80?"), or the whole ("16 is 20% of what number?").

a. Write the unknown as "X."

Note: The unknown may be the percent, the part, or the whole.

Example: 16 is what percent of 80?

16 is X percent of 80.

b. Write the percent (known or unknown) as a fraction with a denominator of 100.

Example: 16 is $\frac{X}{100}$ percent of 80.

c. Write the part and the whole as a fraction, writing the part as the numerator and the whole as the denominator.

Example: $\frac{16}{80}$ $\frac{\text{Part}}{\text{Whole}}$

d. Set up the equation by writing the two fractions with an equal sign between them.

Example: $\frac{X}{100} = \frac{16}{80}$

e. Solve the equation by multiplying the numerator of each fraction by the denominator of the other.

Note: This process is known as *cross multiplying*.

Example: $\frac{X}{100} = \frac{16}{80}$

$80X = 1600$

f. Divide each side of the equation by the multiplier of X.

Example: $80X = 1600$

$X = 20\%$

16 is 20% of 80.

Objective 21

Assignment Sheet 1—Add Whole Numbers

Name ______________________________ Overall Rating __________

Date ______________________________

Evaluation Criteria	**Rating**
• Completed all problems and showed work	______
• Computed a minimum of 18 of the 20 answers correctly per Assignment Sheet 1 answers	______

Basic Skills

Reading

Mathematics

Directions

Solve the following addition problems.

Examples:

$$\begin{array}{r} 5 \\ +\ 10 \\ \hline 15 \end{array} \qquad \begin{array}{r} \mathbf{1} \\ 67 \\ +\ 25 \\ \hline 92 \end{array} \leftarrow \text{Carried digit} \qquad \begin{array}{r} \mathbf{11} \\ 539 \\ 333 \\ +\ 432 \\ \hline 1304 \end{array} \leftarrow \text{Carried digits}$$

a. Solve each of the following addition problems. Show your work.

$$1.\ \begin{array}{r} 2 \\ +\ 9 \\ \hline \end{array} \qquad 2.\ \begin{array}{r} 8 \\ +\ 8 \\ \hline \end{array} \qquad 3.\ \begin{array}{r} 7 \\ +\ 6 \\ \hline \end{array} \qquad 4.\ \begin{array}{r} 15 \\ +\ 8 \\ \hline \end{array} \qquad 5.\ \begin{array}{r} 81 \\ +\ 27 \\ \hline \end{array}$$

$$6.\ \begin{array}{r} 7 \\ 38 \\ +\ 43 \\ \hline \end{array} \qquad 7.\ \begin{array}{r} 55 \\ 88 \\ +\ 99 \\ \hline \end{array} \qquad 8.\ \begin{array}{r} 341 \\ 428 \\ +\ 769 \\ \hline \end{array} \qquad 9.\ \begin{array}{r} 472 \\ 564 \\ +\ 881 \\ \hline \end{array} \qquad 10.\ \begin{array}{r} 9876 \\ 5432 \\ +\ 1122 \\ \hline \end{array}$$

Assignment Sheet 1

b. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. The press operator has 12 cases of white bond. He has ordered and received 8 additional cases. How many total cases does he have?

   Total cases = ________________

2. The ink cabinet has 34 lb. of black, 26 lb. of reflex blue, 9 lb. of warm red, and 15 lb. of pantone yellow. How many pounds of ink is in the cabinet?

   Total pounds of ink = ________________

3. Tonya ordered the following number of binding strips on different dates: 256, 62, 575, and 242. How many binding strips should she be billed for?

   Number of binding strips = ________________

4. If a desktop publisher paid $480 for a scanner, $13 for coated paper, $81 for toner, and $35 for white bond, what was the total cost?

   Total cost = ________________

5. On a major press repair, Bill worked 28 hours, Eliot worked 16 hours, and Shanedra worked 42 hours. What are the total hours worked on this job?

   Total hours worked = ________________

6. In a toolbox are 23 socket wrenches, 14 open-end wrenches, 11 tubing wrenches, and 5 channel-lock wrenches. How many wrenches are in the toolbox?

   Number of wrenches in toolbox = _______________

7. There are 13 cases of legal size bond in the storeroom, 7 cases in the pressroom, and 11 cases in the copy room. How many total cases of bond are there?

   Number of cases = _______________

8. Six copy jobs were completed by the customer service representative. The number of copies for the jobs were 65, 75, 69, 81, 57, and 76. What is the total number of copies made?

   Number of copies made = _______________

9. A customer ordered 40 red booklets, 60 blue booklets, 37 yellow booklets, and 145 white booklets. How many booklets were ordered?

   Total number of booklets = _______________

10. Sheila ordered rollers for several of her presses. The first measured 18 inches long, the second 25 inches long, the third 19 inches long, and the fourth is 46 inches. What is the total length of the rollers combined?

    Total number of inches = _______________

Objective 22

Assignment Sheet 2—Subtract Whole Numbers

Name ____________________ Overall Rating __________

Date ____________________

Evaluation Criteria	Rating
• Completed all problems and showed work	_____
• Computed a minimum of 20 of the 24 answers correctly per Assignment Sheet 2 answers	_____

Basic Skills

Reading Mathematics

Directions

Solve the following subtraction problems.

Examples:				
	12	Original number	57	Original number
	− 7	Subtracted number	− 35	Subtracted number
	+ 5	Answer (difference)	+ 22	Answer (difference)
	12	Check answer (Same as original number)	57	Check answer

a. Solve each of the following subtraction problems. Check your answer by adding the difference to the subtracted number. Show your work.

1. 9 − 5	2. 15 − 8	3. 75 − 22	4. 453 − 47	5. 742 − 318
6. 981 − 698	7. 1420 − 245	8. 3459 − 1649	9. 55722 − 4272	10. 98679 − 8957

Assignment Sheet 2

b. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks. Check your answers by adding the difference to the subtracted number.

1. If a shop needs 172 pounds of black ink and it has 46, how many more pounds of black ink would the shop need?

   Number of pounds of ink needed = ________________

2. If there are 18 cases of canary 20# bond on inventory and you use 6 of them, how many are left?

   Number of cases left = ________________

3. Megan worked 33 hours on 2 major press jobs, and Eric worked 56 hours on similar jobs. How many more hours did Eric work than Megan?

   Difference in hours worked = ________________

4. In the first year of operation, a printing shop handled 1219 jobs. During the second year, the jobs increased to 2167. How many more jobs did the shop do the second year?

   Difference in jobs = ________________

5. To print 5,000 envelopes takes 65 minutes. If you have already worked 27 minutes, how much longer will you need to work?

   Difference in minutes worked = ________________

6. Mr. Hernandez, the instructor, has 240 masking sheets in stock. If 98 are needed during the first semester course, how many are left for the second semester?

   Number of masking sheets left = _______________

7. If the average length of lithographer's tape used in a month is 2100 inches and you used 2310 inches, how much above average is the length of lithographer's tape you used?

   Inches used above average length = _______________

8. You can work only 13 hours this week. The following week you can work 6 hours. How much additional time will it take the third week if the job will take 27 total hours?

   Additional hours required = _______________

9. The pressroom uses 250 pounds of black ink every year. There are only 127 pounds of ink in the storage container. How many more pounds will be needed for the year?

   Pounds needed = _______________

10. Determine the number of impressions printed for each of the five weeks on the press counter readings below.

Week	1	2	3	4	5
Reading (start)	32,119	32,899	33,988	35,976	37,065
Reading (end)	32,899	33,988	35,976	37,065	39,001

Week 1 _______________ impressions

Week 2 _______________ impressions

Week 3 _______________ impressions

Week 4 _______________ impressions

Week 5 _______________ impressions

Objective 23

Assignment Sheet 3—Multiply Whole Numbers

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 18 of the 20 answers correctly per Assignment Sheet 3 answers	______

Basic Skills

Reading Mathematics

Directions

Solve the following multiplication problems.

Examples:

$$\begin{array}{r} \\ 8 \\ \underline{\times 7} \\ 56 \end{array} \qquad \begin{array}{rl} 1 & \leftarrow \text{Carried digit} \\ 53 & \\ \underline{\times 4} & \\ 212 & \end{array} \qquad \begin{array}{rl} 11 & \leftarrow \text{Carried digits} \\ 756 & \\ \underline{\times 312} & \\ 1512 & \leftarrow \text{First partial product} \\ 756 & \leftarrow \text{Second partial product} \\ \underline{2268} & \leftarrow \text{Third partial product} \\ 235872 & \leftarrow \text{Product} \end{array}$$

a. Solve each of the following multiplication problems. Show your work.

1. $\begin{array}{r} 6 \\ \underline{\times 7} \end{array}$
2. $\begin{array}{r} 9 \\ \underline{\times 8} \end{array}$
3. $\begin{array}{r} 54 \\ \underline{\times 6} \end{array}$
4. $\begin{array}{r} 721 \\ \underline{\times 4} \end{array}$
5. $\begin{array}{r} 1682 \\ \underline{\times 5} \end{array}$
6. $\begin{array}{r} 78 \\ \underline{\times 26} \end{array}$
7. $\begin{array}{r} 453 \\ \underline{\times 47} \end{array}$
8. $\begin{array}{r} 314 \\ \underline{\times 527} \end{array}$
9. $\begin{array}{r} 2143 \\ \underline{\times 235} \end{array}$
10. $\begin{array}{r} 4123 \\ \underline{\times 1324} \end{array}$

BEST COPY AVAILABLE

b. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. There are 4 form rollers on a press. How many form rollers are on 8 presses?

   Number of form rollers = _______________

2. There are 24 opaquing pens in a box. How many pens are in 4 boxes?

   Number of pens = _______________

3. There are 500 sheets of paper in a ream. How many are in 6 reams?

   Number of sheets = _______________

4. If it takes 4 new sucker feet per run, how many sucker feet will be needed for 6 runs?

   Sucker feet needed = _______________

5. There are 16 graphic arts students working on printing envelopes. If each student works 8 hours, what are the total hours spent?

   Total hours spent = _______________

6. If blanket wash costs $6 per pound, how much will 58 pounds cost?

   Total cost of blanket wash = _______________

7. It takes 35 minutes to clean a press. How much time will it take to complete 9 complete press washes?

   Total minutes required = _______________

8. How many packages can be shrink wrapped in the wrapper in 9 hours, if 15 can be wrapped in 1 hour?

   Total packages wrapped = _______________

9. Figure the amount of time worked in 4 weeks by 12 typesetters who work 30 hours each week.

   Hours worked = _______________

10. A bindery operator binds 42 books an hour for 6 hours daily for 19 days. Another operator binds 37 books an hour for 6 hours daily for 23 days. A third operator binds 39 books an hour for 6 hours daily for 22 days. What is the total number of books bound by these three operators?

    Total books = _______________

Objective 24

Assignment Sheet 4—Divide Whole Numbers

Name ____________________ Overall Rating __________

Date ____________________

Evaluation Criteria	Rating
• Completed all problems and showed work	_____
• Computed a minimum of 14 of the 16 answers correctly per Assignment Sheet 4 answers	_____

Basic Skills

Reading Mathematics

Directions

Solve the following division problems.

```
Examples:              Answer                 324
               Divisor )Original number      3)972
                                               9
                                               7
                                               6
                                              12
                                              12

            0111   Answer      Check:    111  Answer
         51)5678                       x  51  Divisor
            51                           111
             57                         555
             51                         5661
              68                       +  17  Remainder
              51                        5678  Original number
              17   Remainder
```

BEST COPY AVAILABLE

Assignment Sheet 4

a. Solve each of the following division problems. Check your answers by multiplying the divisor by the answer. Show your work.

1. $2\overline{)8}$
2. $6\overline{)48}$
3. $9\overline{)819}$
4. $4\overline{)1248}$
5. $13\overline{)39}$
6. $66\overline{)198}$
7. $84\overline{)5212}$
8. $124\overline{)345}$
9. $464\overline{)829}$
10. $746\overline{)2872}$

b. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. If a can of ink holds 5 pounds, how many cans can be filled from a 55-pound drum?

   Number of cans = ________________

2. Rex received $418 for a press run. He worked 19 hours on the job. How much did he make per hour?

   Amount earned per hour = ______________

3. How many 4 masking sheet jobs can be stripped using a case containing 416 masking sheets?

   Number of 4 masking sheet jobs = ______________

4. If Melissa can design 4 brochures a day, how many days will it take her to design 92 brochures?

   Number of days = ______________

5. A new paper folder costs $13,104. How much will the school's monthly payments be if the equipment is financed over a 14-month period?

   Monthly payments = ______________

6. A company vice-president has 3,828 business cards. She gives away 116 each day. How many days' supply does she have?

   Number of days = ______________

Objective 25

Assignment Sheet 5—Reduce Fractions to Lowest Terms

Name ____________________ Overall Rating __________

Date ____________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 8 of the 10 answers correctly per Assignment Sheet 5 answers	______

Basic Skills

Reading Mathematics

Directions

Reduce the following fractions to their lowest terms.

Example: $\frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$ $\frac{12}{32} = \frac{12 \div 4}{32 \div 4} = \frac{3}{8}$

A. $^4/_8$ = __________

B. $^8/_{16}$ = __________

C. $^2/_2$ = __________

D. $^4/_{16}$ = __________

E. $^{12}/_{48}$ = __________

F. $^9/_{24}$ = __________

G. $^{16}/_{32}$ = __________

H. $^2/_4$ = __________

I. $^9/_{12}$ = __________

J. $^{50}/_{100}$ = __________

BEST COPY AVAILABLE

Objective 26

Assignment Sheet 6—Convert Fractions and Mixed Numbers

Name ____________________ Overall Rating __________

Date ____________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 30 of the 35 answers correctly per Assignment Sheet 6 answers	______

Basic Skills

Reading Mathematics

Directions

Convert the following fractions and mixed numbers. Reduce to lowest terms when possible.

a. Distinguish among the following fractions by writing a "P" in the blanks before a proper fraction, an "I" before an improper fraction, and an "M" in the blanks before a mixed number.

______ 1. 1/2

______ 2. 3 7/8

______ 3. 16/2

______ 4. 3 1/8

______ 5. 1/4

______ 6. 1/1

______ 7. 7/2

______ 8. 8 1/2

______ 9. 4/4

______ 10. 9 3/16

______ 11. 5 1/2

______ 12. 9/8

______ 13. 9/4

______ 14. 1/8

______ 15. 16 3/4

372

Assignment Sheet 6

b. Convert each of the following mixed numbers to improper fractions. Reduce to lowest terms when possible.

1. $3\ {}^{1}/4$ = ____________
2. $4\ {}^{1}/2$ = ____________
3. $7\ {}^{3}/4$ = ____________
4. $8\ {}^{1}/2$ = ____________
5. $6\ {}^{1}/8$ = ____________
6. $5\ {}^{2}/4$ = ____________
7. $4\ {}^{1}/4$ = ____________
8. $8\ {}^{1}/2$ = ____________
9. $9\ {}^{1}/4$ = ____________
10. $16\ {}^{1}/2$ = ____________

c. Convert each of the following improper fractions to mixed numbers. Reduce to lowest terms when possible.

1. ${}^{7}/4$ = ____________
2. ${}^{9}/2$ = ____________
3. ${}^{6}/4$ = ____________
4. ${}^{15}/8$ = ____________
5. ${}^{19}/16$ = ____________
6. ${}^{11}/8$ = ____________
7. ${}^{75}/32$ = ____________
8. ${}^{5}/2$ = ____________
9. ${}^{15}/4$ = ____________
10. ${}^{33}/16$ = ____________

Objective 27

Assignment Sheet 7—Add Fractions

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 17 of the 19 answers correctly per Assignment Sheet 7 answers	______

Basic Skills

Reading Mathematics

Directions

Adding like fractions:

Examples: Add $^3/_4$ and $^3/_4$.

1. Add the numerators.

   Example: $3 + 3 = 6$

2. Place answer over common denominator and reduce to lowest terms if necessary.

   Example: $^6/_4 = 1\,^2/_4 = 1\,^1/_2$ Answer

Adding unlike fractions:

Examples: Add $^1/_4$ and $^7/_8$.

1. Change to equivalent fractions with lowest common denominator.

   Example: $^7/_8$ remains the same, as 8 is lowest common denominator.

   $^1/_4$ is multiplied by $^2/_2$, or $^1/_4 \times {}^2/_2 = {}^2/_8$.

2. Add the numerators.

   Example: $\frac{7+2}{8} = {}^9/_8$

BEST COPY AVAILABLE

3. Change improper fraction to mixed number and reduce to lowest terms if necessary.

   Example: 9/8 = 9 ÷ 8 = 1 1/8 Answer

Adding mixed numbers:

Example: Add 3 5/8 + 7 5/8.

1. Add numerators.

   Example: $\frac{5 + 5}{8}$ = 10/8

2. Change improper fraction to mixed number and reduce to lowest terms if necessary.

   Example: 10/8 = 10 ÷ 8 = 1 2/8 = 1 1/4

3. Add whole numbers and fractions.

   Example: 3 + 7 + 1 + 1/4 = 11 1/4 Answer

a. Add the following fractions. Show your work in the space provided below the problems. Reduce to lowest terms if necessary. Write your answers on the blanks beside the problems.

1. 7/16 + 5/16 = ________
2. 5/8 + 7/8 = ________
3. 1/4 + 2/8 = ________
4. 4/16 + 3/4 = ________
5. 9/16 + 5/8 = ________
6. 5/8 + 5/32 = ________
7. 3/4 + 5/32 = ________
8. 7/8 + 6/16 = ________
9. 9/16 + 3/4 = ________
10. 4/4 + 25/32 = ________

b. Solve the following problems. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. Add the lengths of two boxes that are 6 1/2 inches and 8 1/4 inches.

   Total length in inches = ____________________

2. Carlos worked 4 1/2 hours before lunch and 3 1/4 hours after lunch. How many hours did Carlos work?

   Total hours worked = ____________________

3. Add the lengths of three forms that are 2 1/8 inches, 3 1/4 inches, and 1 13/16 inches.

   Total length in inches = ____________________

4. Three kardex forms have widths of 6 5/8 inches, 6 3/4 inches, and 6 1/4 inches. What is the total width of the kardex forms combined?

   Total width in inches = ____________________

5. In learning to read an English rule, Taro located 4 7/8 inches on the rule, Gustav read 3 15/16 inches, and Li-Chen located 4 1/4 inches. How many total inches were located?

   Total inches = ____________________

Assignment Sheet 7

6. Add three vacuum tube segments 17 15/16 inches, 16 3/4 inches, and 25 3/8 inches.

   Combined segments in inches = ______________________

7. Three dimensions are 1 11/16 inches, 2 3/8 inches, and 2 3/4 inches. What is the combined dimension?

   Combined dimension in inches = ______________________

8. A container of blanket wash has 1 1/2 liters in it. Jamie adds 1 3/4 liters. How many liters are now in the container?

   Total liters of blanket wash = ______________________

9. A platemaker worked 5 7/8 hours, 3 3/4 hours, and 7 7/16 hours on three jobs. How many total hours did the platemaker work?

   Total hours worked = ______________________

Objective 28

Assignment Sheet 8—Subtract Fractions

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 38 of the 43 answers correctly per Assignment Sheet 8 answers	______

Basic Skills

Reading Mathematics

Directions

Subtracting like fractions:

Examples: Subtract 1/16 from 7/16.

1. Subtract smaller numerator from larger numerator.

   Example: 7 − 1 = 6

2. Place answer over common denominator.

   Example: 6/16

3. Reduce to lowest terms if required.

   Example: 6/16 = 3/8 Answer

Subtracting unlike fractions:

Example: Subtract 1/2 from 3/4.

1. Change to like fractions.

   Example: 3/4 remains the same because 4 is the common denominator.

   1/2 is multiplied by 2/2, or 1/2 x 2/2 = 2/4.

Assignment Sheet 8

2. Subtract as for like fractions and reduce to lowest terms if required.

   Example: $^{3}/_{4} - ^{2}/_{4} = ^{1}/_{4}$ = Answer

Subtracting mixed numbers:

Example: Subtract $3\,^{1}/_{2}$ from $5\,^{1}/_{8}$.

1. Change mixed numbers to like fractions.

   Example: $3\,^{1}/_{2} = 3\,^{4}/_{8}$

2. Borrow a 1 from the original whole number if needed, and convert the 1 to a like fraction, and add it to the smaller fraction.

   Note: This step is needed only if the like fraction in the original number is smaller than the like fraction in the subtracted number.

   Example: $5\,^{1}/_{8} - 1\,^{4}/_{8} = (4\,^{8}/_{8} + ^{1}/_{8}) - 3\,^{4}/_{8} = 4\,^{9}/_{8} - 3\,^{4}/_{8}$

3. Subtract whole number from whole number and like fraction from like fraction, and reduce answer to lowest terms if required.

   Example: $4\,^{9}/_{8} - 3\,^{4}/_{8} = 1\,^{5}/_{8}$ Answer

Subtracting a fraction from a whole number:

Example: $4 - ^{3}/_{16}$

1. Borrow 1 from whole number.

   Example: $4 - 1 = 3$

2. Change borrowed 1 to like fraction.

   Example: $1 = ^{16}/_{16}$

3. Subtract as for like fractions and reduce answer to lowest terms if required.

   Example: $3\,^{16}/_{16} - ^{3}/_{16} = 3\,^{13}/_{16}$ Answer

379

a. Subtract the proper fractions given below. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. $^{3}/_{4} - ^{3}/_{16} =$ __________
2. $^{7}/_{8} - ^{1}/_{4} =$ __________
3. $^{30}/_{32} - ^{3}/_{4} =$ __________
4. $^{25}/_{32} - ^{5}/_{8} =$ __________
5. $^{7}/_{8} - ^{2}/_{16} =$ __________
6. $^{15}/_{16} - ^{3}/_{8} =$ __________
7. $^{1}/_{2} - ^{7}/_{16} =$ __________
8. $^{3}/_{4} - ^{3}/_{8} =$ __________
9. $^{13}/_{16} - ^{9}/_{32} =$ __________
10. $^{7}/_{8} - ^{6}/_{16} =$ __________

b. Subtract the following fractions from whole numbers. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. $4 - ^{3}/_{4} =$ __________
2. $7 - ^{15}/_{16} =$ __________
3. $32 - ^{13}/_{32} =$ __________
4. $175 - ^{4}/_{5} =$
5. $12 - ^{61}/_{64} =$ __________

Assignment Sheet 8

c. Subtract the following mixed numbers from whole numbers. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. 2 – 1 1/3 = __________
2. 3 – 1 3/8 = ________
3. 18 – 9 7/8 = ________
4. 3 – 1 21/32 = ________
5. 27 – 1 5/16 = ________
6. 14 – 6 3/4 = __________
7. 5 – (3 5/32 + 1 9/32) = ______
8. 8 – (1 1/4 + 5 5/8 + 1/16) = ____
9. 4 – 3 1/3 = __________
10. 42 – 3 7/16 = __________

d. Subtract the following mixed numbers. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. 1 3/5 – 1 1/5 = ________
2. 72 6/16 – 22 7/16 = ____
3. 7 5/6 – 2 1/6 = ________
4. 18 7/8 – 9 3/8 = ______
5. 35 5/8 – 8 1/2 ________
6. 5 1/4 – (1 1/8 + 1 7/8) = ____
7. 12 1/2 – (7 1/4 + 3 1/8) = __
8. 4 29/32 – 1 19/32 = ________
9. 5 15/32 – 2 31/32 = ________
10. 8 1/16 – 4 7/8 = __________

e. Solve the following word problems. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. Jim had a 7/8-inch wrench. He needed a 3/4-inch wrench. How much difference is there in the size of the wrenches?

   Differences in inches = ____________________.

2. Loraine worked 5 1/4 hours on a folding job, and Tony worked 4 1/2 hours on the same installation. How much faster did Tony work than Loraine?

   Difference in hours = ____________________

3. A press is to be installed 4 1/2 feet from the wall. Two pieces of rubber floor mats will be installed between the wall and the press. If one piece of mat is 1 5/8 feet wide, how wide must the second piece be to touch the press?

   Width of mat in feet = ____________________

4. Three pieces of paper are cut from a piece 35 1/2 inches long. The lengths are 7 1/4 inches, 11 3/8 inches, and 6 1/2 inches. If 3/8 inch of paper is wasted in cutting, how much paper is left?

   Length of paper left in inches = ____________________

5. A piece of chipboard is 32 $1/2$ inches long. Short pieces of the following lengths are cut from it: 6 $1/2$ inches, 5 $1/4$ inches, 8 $13/16$ inches, and 10 $9/16$ inches. How much chipboard is left?

   Amount of chipboard left in inches = ____________________

6. A fountain concentrate has 16 $3/10$ gallons of fountain solution in it. After using 9 $3/4$ gallons, how many gallons will be left?

   Number of gallons = ____________________

7. A container of fixer holds 4 $1/4$ liters. How much fixer is left after using $1/2$ liter to fill the film processor?

   Number of liters left = ____________________

8. A length of vacuum hose is $1/2$ inch by 10 inches. If 1 $3/8$ inches are cut from its length, what will the final length of the vacuum hose be?

   Vacuum hose length in inches = ____________________

Objective 29

Assignment Sheet 9—Multiply Fractions

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 9 of the 11 answers correctly per Assignment Sheet 9 answers	______

Basic Skills

Reading Mathematics

Directions

Solve the following multiplication problems.

Example:

$\frac{2}{3} \times \frac{3}{4}$ becomes $\frac{2 \times 3}{3 \times 4} = \frac{6}{12} = \frac{1}{2}$

a. Multiply the following fractions. Convert mixed fractions where needed and reduce answers to lowest terms.

1. $\frac{1}{2} \times \frac{3}{4} =$ __________
2. $1\frac{1}{2} \times 2\frac{1}{4} =$ __________
3. $\frac{7}{8} \times \frac{2}{3} =$ __________
4. $\frac{1}{4} \times \frac{1}{3} \times \frac{1}{2} =$ __________
5. $\frac{3}{8} \times \frac{5}{16} =$ __________
6. $\frac{1}{2} \times 6\frac{1}{2} =$ __________
7. $1\frac{1}{3} \times 2\frac{1}{4} \times \frac{1}{2} =$ ______
8. $2\frac{3}{4} \times 6\frac{1}{8} =$ __________

334

BEST COPY AVAILABLE

b. Solve the following word problems. Show your work in the space provided. Write your answers on the blanks.

1. A certain developer requires mixing 3/4 gallon developer concentrate and 1/4 gallon water to make a gallon of developer. How much developer concentrate should a worker use if she needs to mix only 1/3 gallon of developer?

   Amount of developer concentrate = ____________________

2. There are 296 business cards in a full box. How many business cards are there in 1/4 of a box?

   Number of business cards = ____________________

3. After completing a press job, a company has 8 2/3 pounds of ink left in three different PMS colors. If one-half of the ink is PMS 545, how many pounds of PMS 545 are left?

   Pounds of PMS 545 left = ____________________

Objective 30

Assignment Sheet 10—Add Decimal Numbers

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 35 of the 40 answers correctly per Assignment Sheet 10 answers	______

Basic Skills

Reading Mathematics

Directions

Solve the following decimal addition problems.

a. Write the name of the place for each *underlined* digit.

__________ 1. $867.\underline{4}3$ __________ 4. $6.239\underline{5}$

__________ 2. $6.3\underline{7}892$ __________ 5. $0.47\underline{6}$

__________ 3. $1.000\underline{8}$

b. Write the name of the place for the last digit in each of the following numbers.

__________ 1. 0.38 __________ 4. 427.389

__________ 2. 0.4678 __________ 5. 44.67

__________ 3. 321.9

c. Underline the digit that is in the place named in italics.

1. 46.3826 *Hundredths*
2. 35.0038 *Ten thousandths*
3. 148.296 *Tenths*
4. 6758.23 *Hundredths*
5. 91.4082 *Thousandths*
6. 204.37 *Tens*
7. 14.0079 *Ones (units)*
8. 208.097 *Hundredths*
9. 5.23981 *Thousandths*
10. 502.967 *Tenths*
11. 5230.867 *Thousandths*
12. 587.029 *Ones (units)*
13. 0.298 *Hundredths*
14. 329.768 *Tens*
15. 52.694 *Thousandths*
16. 498.276 *Tenths*
17. 0.5296 *Ten thousandths*
18. 468.539 *Hundredths*
19. 324.06 *Tenths*
20. 567.8 *Ones (units)*

d. Set up the following groups of numbers in columns. Add each column, carrying when necessary and placing the decimal point correctly.

1. 0.024 + .165

2. 87.3 + 370

3. 15.127 + 3.4 + .0091 + 236.87

4. 195.7 + 83 + 9.006

5. .5280 + 435 + 179.50 + 1.9

e. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. Motoaki earned $22.50 on a design job, and Maria earned $16.50. How much did they earn together?

   Total amount earned = ________________

2. On a press run, labor costs $54.65, paper and supplies cost $16.30, and the tax is $3.38. What is the total cost of the job?

   Total cost = ________________

3. Fhonda worked four days on a design project. She worked 6.8 hours Monday, 7.4 hours Tuesday, 5.3 hours Wednesday, and 4.4 hours Thursday. How many total hours did she work?

   Total hours worked = ________________

4. Daniel was cleaning out the storage cabinet. He found three partially used bottles of color wash, each containing the following amounts: 6.7 liters, 12.0 liters, and .5 liters. How many total liters of color wash were stored?

   Total liters of color wash = ________________

5. In one month, a print shop owner has the following expenses: equipment repair, $286.96; paper, $142.37; electric bill, $160.16; telephone, $116.27; and labor, $15,312.50. What was the owner's total monthly expenditure?

   Total monthly expense = ________________

Objective 31

Assignment Sheet 11—Subtract Decimal Numbers

Name ______________________ Overall Rating ________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 12 of the 15 answers correctly per Assignment Sheet 11 answers	______

Basic Skills

Reading Mathematics

Directions

Solve the following decimal subtraction problems.

a. Set up each of the following problems in column form. Subtract and check your work. Remember, when you subtract decimals, the decimal points must be aligned.

1. 868.87 – 516.89 = ________

2. 567 – 19.856 = ________

3. 198 – 56.987 = ________

4. 567.94 – 59.78 = ________

5. $815.23 – $65.98 = ________

6. $20.03 – $15.88 = __________

7. 694.7 – 24.3 = __________

8. 5,000 – 892.66 = __________

9. $15 – $12.53 = __________

10. $219.30 – $21.85 = ____________

b. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. A print shop owner received $8438.64 in December, and paid out $5121.32 in January. How much profit did the shop make?

   Profit = ________________

2. It takes 20.5 hours to finish a job. Justin has worked 6 hours. How much longer will it take him to finish the job?

   Hours required to finish job = ________________

3. A piece of chipboard 6.14 inches long was cut from a sheet 8.98 inches in length. How much chipboard was left?

   Inches of chipboard left = ________________

4. A solvent container holds 49.2 liters of blanket wash. After a day, workers have used 8.7 liters. How much blanket wash is left in the container?

   Liters of blanket wash left in the container = ________________

5. You have a piece of vacuum hose with a length of 27.5 inches, but the length it must be run is 55 inches long. How many more inches must the vacuum hose be to be run?

   Inches = ________________

Objective 32

Assignment Sheet 12—Multiply Decimal Numbers

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Completed all problems and showed work	______
• Computed a minimum of 14 of the 16 answers correctly per Assignment Sheet 12 answers	______

Basic Skills

Reading Mathematics

Directions

Solve the following decimal multiplication problems.

Example:

$$\begin{array}{rl} 16.11 & \text{2 Decimal places} \\ \underline{\times\ 2.2} & \text{1 Decimal place} \\ 3222 & \\ \underline{3222} & \\ 35.442 & \text{3 Decimal places in answer} \end{array}$$

a. Set up each of the following problems in column form and multiply. Locate the decimal point in the answer.

1. 2.64 x 3.1 = __________

2. 120 x 0.33 = __________

3. 2.25 x 0.51 = __________

4. 35 x 8.5 = __________

5. 26.4 x 3.8 = __________

BEST COPY AVAILABLE

6. 7.02 x 0.92 = __________

7. 0.83 x 0.55 = __________

8. 28.2 x 0.9 = __________

9. 0.069 x 0.01 = __________

10. 7.52 x 3.01 = __________

b. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. An ink mixing kit is placed on sale for 25 percent off. By what amount is the price reduced if the regular price is $1349.80?

   Note: Twenty-five percent is the same as the decimal .25.

   Price reduction = ________________

2. The average cost of a replacement part on the press is $41.25. During the year, the print shop installs 150 such parts. What is the total cost?

   Total average cost = ________________

3. What is the total thickness of 7 pieces of cover stock if each piece is .04 inches thick?

   Total thickness in inches = ________________

4. What is the cost of 15 gallons of blanket wash at $1.13 per gallon?

Cost = ______________

5. If replacement vacuum tubes cost 78¢ each, what is the cost of 2 dozen vacuum tubes?

Cost = ______________

6. Carmelita completed 6 folding jobs in the last five days. She worked 5.6 hours the first day, 3.8 hours the second day, 4.4 hours the third day, 2 hours the fourth day, and 6.6 hours the fifth day. Using this 5-day period as an average, how many hours would Carmelita work over a 15-day period?

Hours = ______________

Objective 33

Assignment Sheet 13—Divide Decimal Numbers

Name ____________________ Overall Rating __________

Date ____________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 13 of the 15 answers correctly per Assignment Sheet 13 answers	______

Basic Skills

Reading Mathematics

Directions

Solve the following decimal division problems.

a. Set up each of the following problems in column form and multiply. Locate the decimal point in the answer.

1. $4.5 \div 0.5 =$ __________

2. $4.96 \div 0.4 =$ __________

3. $19.8 \div 0.6 =$ __________

4. $10.71 \div 0.07 =$ __________

5. $0.225 \div 0.15 =$ __________

Assignment Sheet 13

6. 1.7608 ÷ 0.0062 = ______

7. 0.48 ÷ 0.6 = ______

8. 0.125 ÷ 0.25 = ______

9. 0.9 ÷ 0.003 = ______

10. 1.16 ÷ 2.9 = ______

b. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. What is the approximate cost per roller if the cost of 12 rollers is $103.68?

   Approximate cost = ______

2. How many hours did Amanda work if she was paid a total of $681.75 at the rate of $22.50 per hour?

   Total hours = ______

3. How many jobs can be completed in 21.12 hours if the average job takes .66 hours?

   Number of jobs = ______

4. Curt spent $172.80 for equipment. What was the cost per piece if he bought 8 pieces of equally priced equipment?

   Cost per piece = ________________

5. A shipment of 114 identical reams of paper has arrived at Ms. Ortega's printing shop. Ms. Ortega pays the carrier $544.98 for all of them. How much does 1 ream cost?

   Cost of 1 ream = ________________

Objective 34

Assignment Sheet 14—Convert Fractions and Percentages

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems and showed work	______
• Computed a minimum of 54 of the 60 answers correctly per Assignment Sheet 14 answers	______

Basic Skills

Reading Mathematics

Directions

Solve the conversion problems.

a. Express each of the following fractions as a decimal.

1. 1/8 = __________
2. 1/4 = __________
3. 1/2 = __________
4. 3/4 = __________
5. 5/8 = __________
6. 1/16 = __________
7. 3/32 = __________
8. 7/8 = __________
9. 9/16 = __________
10. 15/16 = __________

Assignment Sheet 14

b. Express each of the following fractions as a percentage.

1. $^{1}/_{4}$ = ____________
2. $^{1}/_{2}$ = ____________
3. $^{7}/_{10}$ = ____________
4. $^{3}/_{4}$ = ____________
5. $^{2}/_{2}$ = ____________
6. $^{1}/_{10}$ = ____________
7. $^{7}/_{8}$ = ____________
8. $^{5}/_{10}$ = ____________
9. $^{1}/_{3}$ = ____________
10. $^{5}/_{8}$ = ____________

c. Match the decimal numbers on the right with their correct equivalent fractions. Write the correct letters in the blanks.

______	1.	$5\ ^{6}/_{10}$	a.	7.083
______	2.	$1\ ^{2}/_{100}$	b.	5.006
______	3.	$^{87}/_{1000}$	c.	78.3
______	4.	$7\ ^{83}/_{1000}$	d.	0.087
______	5.	$5\ ^{6}/_{100}$	e.	0.783
______	6.	$5\ ^{6}/_{1000}$	f.	87.7
______	7.	$78\ ^{3}/_{10}$	g.	5.6
______	8.	$87\ ^{7}/_{10}$	h.	102.0
______	9.	102	i.	5.06
______	10.	$^{783}/_{1000}$	j.	1.02

d. Write decimal equivalents for each of the following fractions.

1. 63 9/10 = ________
2. 5 93/100 = ________
3. 5 93/1000 = ________
4. 5 93/10000 ________
5. 3 825/1000 = ________
6. 38 95/100 = ________
7. 38 95/1000 = ________
8. 42 3/10 = ________
9. 402 3/10 = ________
10. 897 97/100000 = ________

e. Express each of the following percentages as a fraction. Reduce to the lowest terms.

1. 50% = ________
2. 25% = ________
3. 33 1/3% = ________
4. 36% ________
5. 28% = ________
6. 14 2/7% = ________
7. 21% = ________
8. 75% = ________
9. 66 2/3% = ________
10. 70% = ________

f. Express each of the following percentages as a decimal.

1. 47% = ___________
2. 15% = ___________
3. 33.3% = _________
4. 62% ___________
5. 75% = ___________
6. 3% = ___________
7. 16.8% = ___________
8. 9% = ___________
9. 10% = ___________
10. 50% = ___________

401

Objective 35

Assignment Sheet 15—Solve Percentage Problems

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Completed all problems	______
• Computed a minimum of 25 of the 29 answers correctly per Assignment Sheet 15 answers	______

Basic Skills

Reading Mathematics

Directions

Calculate the answers to the following percentage problems.

a. What does it mean to say 100 percent of the work is completed? ______

____

b. There are usually 100 cans of ink in the cabinet. Fourteen of them are missing. What percent of the ink is missing? ______________

c. If 14 of the cans of ink are missing in the above problem, how many are present? ______________

What percent is present? ______________

d. There are 100 boxes in a carton. Twenty-five boxes are what percent of the boxes in the carton? ______________

e. There are 100 jobs on the board. Ninety-four have been completed. What percent of the jobs have been completed? ______________

f. If 94 of the jobs in the above problem have been completed, how many have not been? ______________

What percent has not been completed? ______________

g. If 11 percent of the students in a school are absent, what percent are present? ______

h. If 6 percent of the reams of canary paper that a printing shop had in stock were not sold, what percent were sold? ______

i. If 60 percent of the press operators in town had helpers, what percent did not have helpers? ______

j. Adam has a set of press tools. Ten percent of his tools are a year old, and 40 percent are over a year old. What percent are less than a year old?

______

k. Heather has three types of screwdrivers—flat, Phillips, and square. Eighty percent of her screwdrivers are flat, and 15 percent are square. What percent are Phillips? ______

l. The Clarks spent 22 percent of their income for their business: 17 percent for equipment, 15 percent for paper, and 8 percent for supplies. What percent was left for other things? ______

m. Hyun-lee has finished 75 percent of the job he is doing. What percent does he still have to do? ______

n. Wendy has completed 40 percent of her training. What percent does she still have to do? ______

o. If you were told to complete 93 percent of the work, what percent would be left? ______

p. Solve each of the following percentage problems.

1. 3% of 72 is what number? __________
2. 5% of 18 is what number? __________
3. What number is 33 1/3% of 96? __________
4. 40% of 125 is what number? __________
5. 68% of 63.5 is what number? __________
6. What number is 12 1/2% of 140.8? __________
7. What number is 1% of 103? __________
8. What number is 37 1/2% of 152? __________
9. 50% of 32.8 is what number? __________
10. 7% of 163 is what number? __________

q. Solve the following percentage word problems.

1. There are 20 students in a class. Sixty percent of the students are boys. How many are boys. ______________________________
2. One day 5 percent of the 20 bindery operators in Mr. Caldwell's group made perfect time completing a job. How many bindery operators made perfect time? ______________________________
3. Shop owner McGill bought a new stitcher—regularly selling for $120—at a sale and saved 20 percent. How much money did he save? ______________________________
4. The number of desktop publishers at the meeting this year was 75 percent of what it was last year. Last year there were 800 desktop publishers at the meeting. How many desktop publishers were at the meeting this year? ______________________________

Objective 36

Assignment Sheet 16—Read a U.S. Customary Rule

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Student followed directions	______
• Computed a minimum of 34 of the 40 answers correctly per Assignment Sheet 16 answers	______

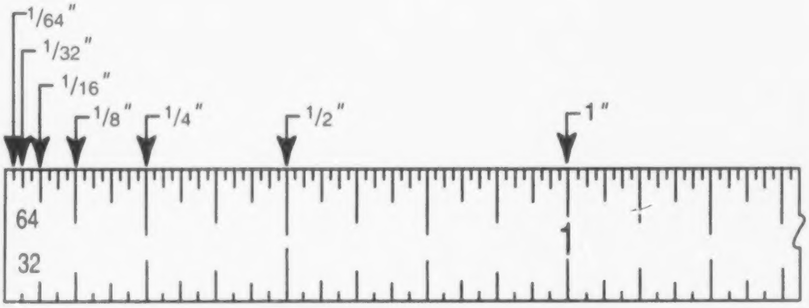
Basic Skills

Reading Mathematics

Reading fractional measurements on a U.S. customary rule

Note: All rules are read similarly. However, some rules are graduated with more divisions than others. The enlarged rule illustrated in Figure 1 is graduated in sixty-fourths of an inch on the top scale and thirty-seconds of an inch on the bottom scale. The staggered graduations are for halves, quarters, eighths, sixteenths, thirty-seconds, etc.

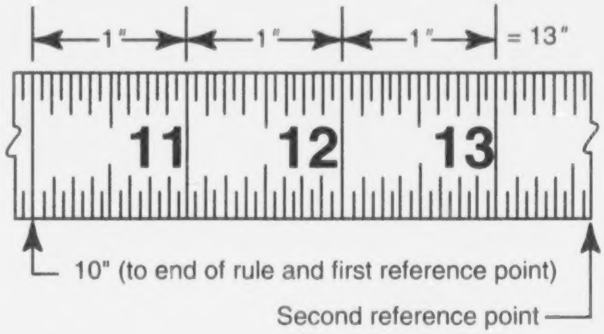
Figure 1



1. Align the end of the rule with one reference point.

2. Determine the number of whole units between the end of the rule and the second reference point (see Figure 2).

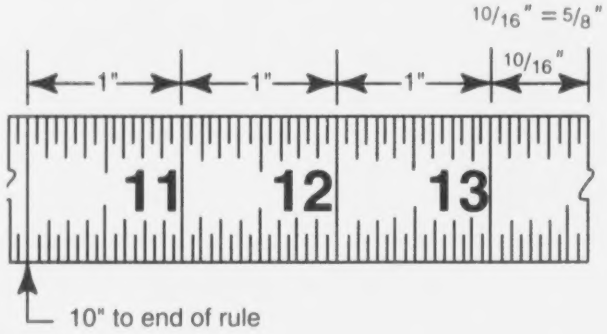
Figure 2


1"
1"
1"
= 13"
11
12
13
10" (to end of rule and first reference point)
Second reference point

3. Determine the number of fractional units between the last whole unit and the second reference point by counting the divisions.

4. Place this number over the rule scale (the rule in Figure 3 below is scaled in sixteenths of an inch) and reduce this fraction if possible.

Figure 3


10/16" = 5/8"
1"
1"
1"
10/16"
11
12
13
10" to end of rule

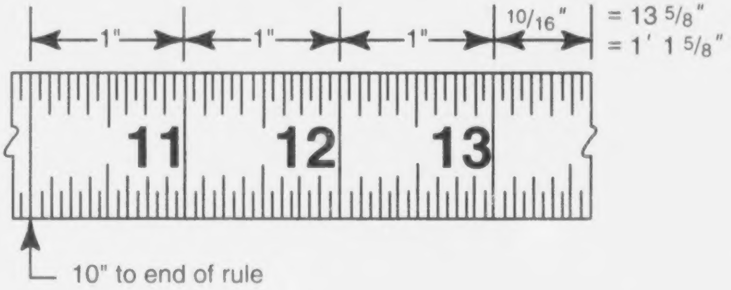
406

5. Make a mixed fraction by adding this reduced fraction to the number of whole units counted earlier; convert inches to feet if necessary by dividing 12 into the total whole inches measured (see Figure 4).

Example: 3 inches + 5/8 inch = 3 5/8 inches

Figure 4

3 inches + 5/8 inch = 3 5/8 inches

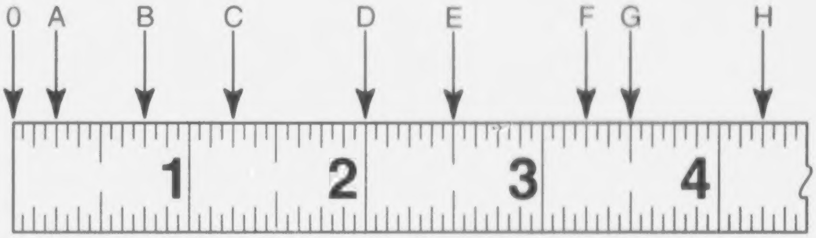


Exercise

Directions

Write the correct answers on the blanks provided.

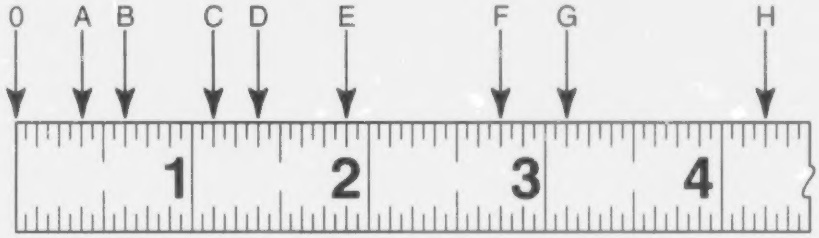
a. Read the U.S. customary rule illustrated below to the nearest quarter inch. Write your answers on the blanks provided.



1. 0 to A = ______________
2. A to B = ______________
3. 0 to C = ______________
4. A to D = ______________
5. B to D = ______________
6. 0 to E = ______________
7. C to E = ______________
8. B to F = ______________
9. D to G = ______________
10. A to H = ______________

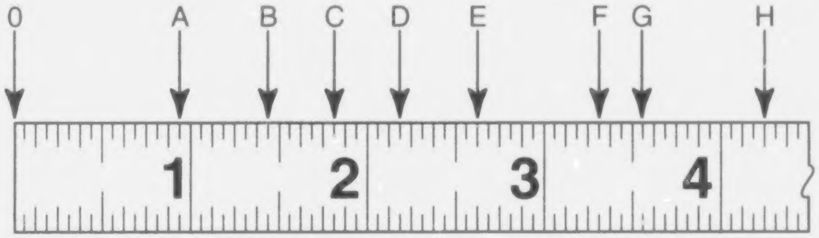
Assignment Sheet 16

b. Read the U.S. customary rule illustrated below to the nearest eighth inch. Write your answers on the blanks provided.



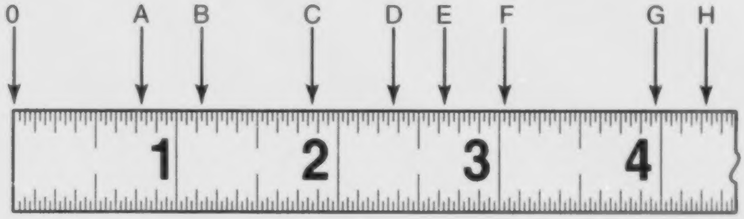
1. 0 to A = ________________
2. A to B = ________________
3. 0 to C = ________________
4. B to D = ________________
5. A to E = ________________
6. 0 to F = ________________
7. D to E = ________________
8. C to G = ________________
9. 0 to H = ________________
10. E to H = ________________

c. Read the U.S. customary rule illustrated below to the nearest sixteenth inch. Write your answers on the blanks provided.



1. 0 to A = ________________
2. A to B = ________________
3. 0 to C = ________________
4. B to D = ________________
5. A to E = ________________
6. 0 to F = ________________
7. C to F = ________________
8. A to G = ________________
9. 0 to H = ________________
10. E to H = ________________

d. Read the U.S. customary rule illustrated below to the nearest one thirty-second of an inch. Write your answers on the blanks provided.



1. 0 to A = ____________
2. 0 to B = ____________
3. A to B = ____________
4. 0 to C = ____________
5. A to D = ____________
6. B to E = ____________
7. C to F = ____________
8. B to G = ____________
9. 0 to H = ____________
10. D to H = ____________

409

Unit Contents

Student Components

Student Page

Objective Sheet 4–3

Information Sheet 4–5

Student Supplement

1—Traditional Printing vs. Digital Printing 4–13

Assignment Sheets

1—Make an Organizational Chart of the School Print Shop 4–15
2—Draw a Floor Plan Locating Production Areas in the School Print Shop 4–17
3—Compare Job Tickets for Similarities and Differences 4–19
4—Read and Comprehend Information on a Job Ticket 4–21

Objective Sheet

Unit Objective

After completing this unit, the student should be able to name production steps of a job using traditional printing methods and describe the duties of each worker. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Name five major concerns of successful printing plant management.
2. Complete statements concerning strategies a manager can use to operate a graphic arts business.
3. Match job titles with descriptions of job duties.
4. Arrange in proper sequence the production steps of a job using traditional printing methods.
5. List items essential to proper job production control.
6. Select true statements concerning quality control.
7. Match the components of a job ticket with their descriptions.
8. Arrange in proper sequence the steps for initiating a printing job.
9. Make an organizational chart of the school print shop. (Assignment Sheet 1)
10. Draw a floor plan locating production areas in the school print shop. (Assignment Sheet 2)
11. Compare job tickets for similarities and differences. (Assignment Sheet 3)
12. Read and comprehend information on a job ticket. (Assignment Sheet 4)

Information Sheet

Objective 1

Major concerns of successful printing plant management

a. Safety

b. Cleanliness

c. Efficiency of operation

d. Quality

e. Profit

Note: Keep in mind no business survives without being profitable. Therefore, profit, or the "bottom line" is a vital concern to successful printing plant management. That is not to say profit is more important than the other concerns listed, such as safety, efficiency, cleanliness, and quality. Without due concern for safety, injuries and lost-time accidents erase profits through inefficiency. Likewise, a lack of quality in the end product reduces return business or causes costly "remakes," which double costs and many times lose business. Also, without cleanliness, efficiency is reduced, again affecting net income and overall profitability. So, all management concerns should be aimed at long term survival and profitability of the operation.

Objective 2

Strategies a manager can use to operate a graphic arts business

a. Use organization manuals to tell about the firm.

b. Provide organizational charts that show the chain of command and where people fit into the firm.

c. Set policies and rules to convey what employees can and cannot do.

d. Provide job descriptions to define workers' tasks.

e. Allow for two-way communication in which the manager talks to employees and employees may talk to the manager.

f. Use computer recordkeeping systems that permit quick retrieval of information about current and completed printing jobs.

Note: A company cannot run itself. Good management is vital to the success of a graphic arts business.

Objective 3

Job titles and descriptions of job duties

a. Manager—Organizes and supervises production in the shop or plant

Note: This role may also be titled supervisor, owner, superintendent, or foreman.

b. Sales and customer service representatives—Initiate job orders and maintain good customer relations during and after the job

c. Estimator—Estimates the total cost of a printing job

d. Copywriters—Write the copy for printing jobs

e. Design personnel—Plan and arrange type and visual elements for the printing job

f. Electronic prepress personnel—Prepare materials for output to imagesetters, large-format printers, platesetters, or other PostScript-type devices at a print shop

g. Photographer—Provides photographs and special photographic illustrations for jobs

h. Artists—Provide special art and illustrations for printing jobs

i. Mark-up personnel—Copyfit and mark the type, style, and size designations for printing

j. Typesetters—Compose or set type according to mark-up specifications

k. Paste-up personnel—Assemble elements of a layout for reproduction

l. Proofreaders—Read the proofs at various stages of production to make sure there are no mistakes

m. Camera operators—Provide the film negative of the printing job

Note: Camera operators also make proofs.

n. Strippers—Tape the negatives in their proper place on the printing mask or flat

o. Platemakers—Expose the plate and develop it so it is ready for the press

Note: Platemakers also proof materials.

p. Press operators—Prepare press for operation and run the finished plate on the press

q. Feeder and helper—Help press operator load paper table and unload delivery table

413

r. Bindery personnel—Complete bindery work, such as collating, folding, and stitching

s. Shipping personnel—Pack, label, and ship or deliver completed jobs

t. Filing personnel—File flats and plates in customer job files

u. Billing personnel—Make out invoices and bill customers for completed work

Note: As technology revamps the entire graphic arts industry, new job titles and duties result as old positions become obsolete and computers and digital equipment replace older type and photo generation, storage and retrieval systems. By the mid-1990s some printing operations on the leading edge of technological advance were capable of producing text and photo-bearing pages at the desktop publishing phase and carrying the process directly to the press within the computer system—no camera operators, no strippers, no plate makers. Although the prospect of computer-to-press operations gravely concerns those individuals currently employed in soon-to-be obsolete technology, the competitive nature of the graphic arts industry demands computer equipment be used to reduce labor costs whenever possible.

Objective 4

Sequence of production steps of a job using traditional printing methods

Note: In Unit 5, "Printing Processes" you will study digital printing processes. You will find that many of the traditional printing methods outlined in this objective have been replaced by digital printing processes.

a. Sales and estimate

b. Job order

c. Copywriter

d. Design

e. Mark-up

f. Typesetting

g. Proofreading

h. Paste-up

i. Proofreading

j. Camera

k. Stripping

l. Prepress proofing

m. Platemaking

414

n. Presswork

o. Binding and finishing

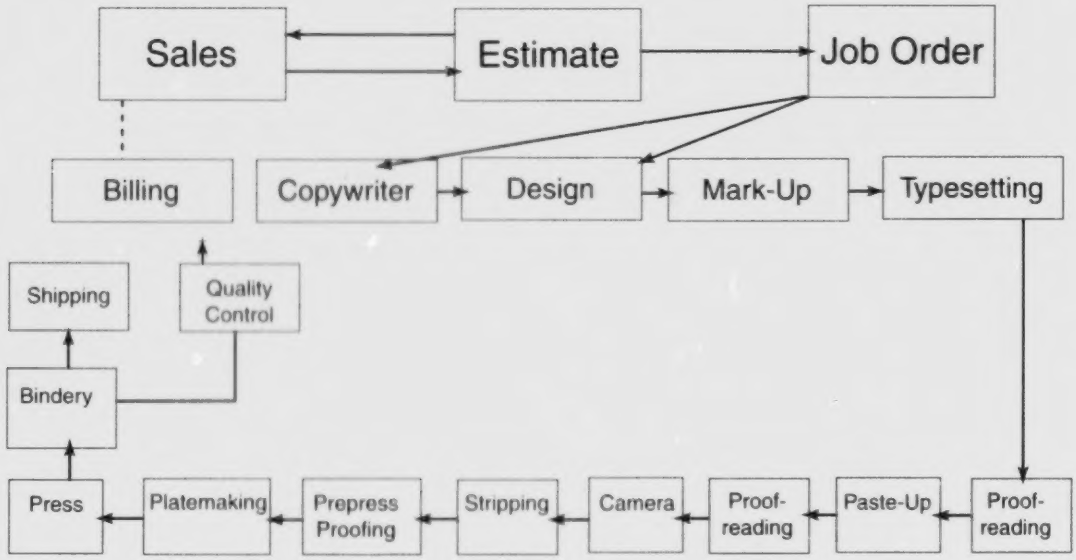
p. Quality control

q. Packaging, shipping, and delivery

r. Billing

Note: Computers are integrating increasing numbers of production steps.

Figure 1



Sales
Estimate
Job Order
Billing
Copywriter
Design
Mark-Up
Typesetting
Shipping
Quality Control
Bindery
Press
Platemaking
Prepress Proofing
Stripping
Camera
Proof-reading
Paste-Up
Proof-reading

Objective 5

Items essential to proper job production control

a. Job ticket—Formal, written specification sheet which serves as a blueprint for the printing job and follows a job from order taking to delivery

b. Log book with job numbers and/or computer spreadsheet program

c. Identified job material folder (or envelope)

d. Computer record for job tracking through printing plant

415

Objective 6

Quality control

Note: Press operators perform quality control checks throughout the pressrun. They periodically pull newly printed sheets to inspect print quality and monitor the functioning of the press. Quality control devices are used as necessary.

a. Understand the purpose of quality control on the press

b. Understand minimum company standards for quality printing

c. Understand the role of monitoring in maintaining good printing quality

d. Understand how different kinds of materials can affect press performance and quality, including:

  - Conditions relating to paper and register
  - Conditions relating to ink transfer and color control

e. Monitor and control printing quality, including:

  - Register
  - Color
  - Check setoff
  - Elimination of hickeys
  - Ink film thickness
  - Quality and condition of paper
  - Storage and handling of paper
  - Quality of prepress activities
  - Printing process and inspection
  - Postpress inspection

f. Understand how to record technical data and results

g. Monitor, control, and adjust the printing process to maintain specified requirements on the job ticket, including:

  - Quality
  - Dot gain
  - Trapping
  - Register
  - Ink density
  - Color and cleanliness
  - Reproduction and quality and resolution

Information Sheet

Objective 7

Components of a job ticket and their descriptions

a. Invoice to—Includes customer name and address, contact person, billing information, quotation, and other important business information

b. Job specifications—Includes quantity, description, flat size, finish size, and invoice amount of the printing job

c. Type/art—Indicates various actions such as set changes only, set entire job, paste-up, and create mechanicals. Additional information or specifications can be written in.

d. Prep—Informs the personnel in the prep department of what needs to be done. Various stages are also checked to verify that the following are available: camera-ready art, one piece of film or a number of negatives, or separations to print a full-color job.

   Note: Sometimes the job has been printed before. If so, the job may be repeated without any changes.

e. Proofs—Indicates the types of proofs requested such as blueline, color key, cromalin proof, or press check. Space is also available to note if a press proof is not necessary.

f. Paper—Includes color, size, weight, grain direction, finish, brand, supplier, and cutting requirements of paper to be used in the printing job

g. Press—Includes specifics such as which press the job will be printed on, number of copies, ink colors, and waste allowance

h. Bindery—Indicates all finishing activities to be performed including cutting, folding, drilling, perforation, die cutting, etc.

i. Vendors—Indicates any material to be supplied or an activity performed by an outside company

j. Mailing—Includes mailing information such as class, bulk-rate permit, PS labels, UPS shipping number, Fed Ex shipping number, etc.

k. Packaging/ship to—Indicates how printing job will be packed such as band, wrap, shrink, box, and skids as well as how printing job will be shipped

   Note: There are a number of ways of packaging the finished job for delivery to the customer. A small letterhead job might be packed in a sturdy box and mailed, while a large run of a multi-page booklet would probably be boxed, packed on skids, and shipped by truck.

l. Art/samples—Indicates if the art needs to be returned or not and where the samples of the printing job should be sent

   Note: Some printers store artwork and other materials for the customer for future runs, but the originals are not returned. Printed samples are often mailed to the customer and/or advertising agency.

Objective 8

Proper sequence for initiating a printing job

a. Fill out the complete job order form.

b. Enter job in log book or computer program, assign number.

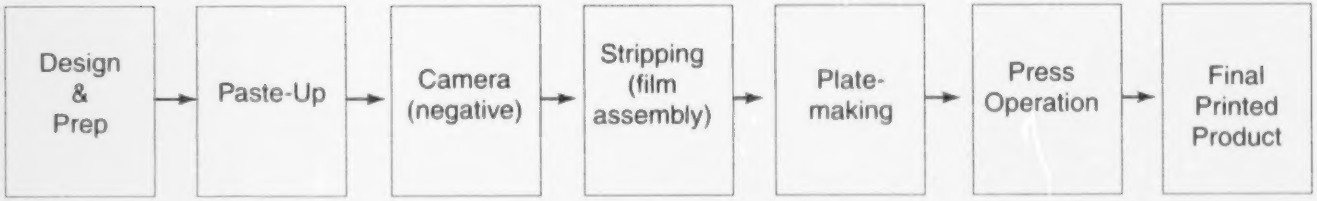
c. Mark material folder, insert job order and job material.

Note: Be sure all material is complete and note specialty items, photos, artwork, etc., needed for a job.

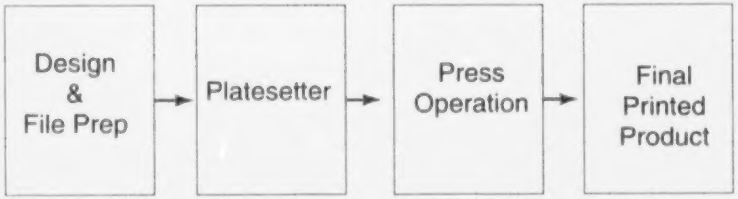
d. Put folder in proper station of material job flow file.

Student Supplement 1—Traditional Printing vs. Digital Printing

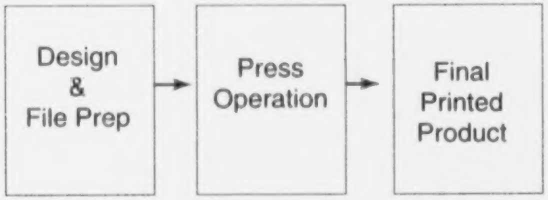
Traditional Printing


Design & Prep
Paste-Up
Camera (negative)
Stripping (film assembly)
Plate-making
Press Operation
Final Printed Product

Computer-to-Plate


Design & File Prep
Platesetter
Press Operation
Final Printed Product

Computer-to-Press


Design & File Prep
Press Operation
Final Printed Product

Objective 9

Assignment Sheet 1—Make an Organizational Chart of the School Print Shop

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Student followed directions	______
• Chart should accurately reflect that of the school and shop	______
• Chart should be neat and legible	______

Basic Skills

Reading Writing

Directions

Using a block diagram, make an organizational chart showing all departments and workstation assignments in your school print shop. Indicate the following:

1. School administration
2. Instructor
3. Instructor's aide
4. Shop supervisor (student)
5. Assistant shop supervisor (student)
6. Crew chiefs (students)
7. Work and cleanup stations (students)

Objective 10

Assignment Sheet 2—Draw a Floor Plan Locating Production Areas in the School Print Shop

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Student followed directions	_____
• Production areas were placed correctly on map	_____
• Suggested changes were well-considered and justified	_____

Basic Skills

Reading Writing Critical Thinking

Directions

On a separate sheet of paper, sketch and label a floor plan of your school print shop. Make it large enough to provide the space to indicate the location of all of the following production areas that apply to your school print shop.

Note: If your school print shop contains production areas not listed below, then include these areas on your floor plan also.

1. Job order department
2. Copywriting, design, and mark-up
3. Typesetting
4. Proofreading
5. Paste-up
6. Camera/darkroom
7. Stripping
8. Platemaking
9. Presses
10. Bindery
11. Storeroom

Assignment Sheet 2

With arrows, indicate on your floor plan the production flow from the beginning of a job to the end. Based on the production flow, would you change anything to increase efficiency? Give your reasons.

Objective 11

Assignment Sheet 3—Compare Job Tickets for Similarities and Differences

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Student followed directions	______
• Information is accurate	______
• Assignment was completed on time	______
• Assignment was neat and concise	______

Basic Skills

Reading Writing Critical Thinking

Introduction

All print shops use some type of job ticket to track jobs as they move through the plant. Although job tickets serve a similar function, they do not all contain exactly the same information. This assignment will give you the opportunity to compare three job tickets and note their similarities and differences.

Directions

Using three sample job tickets provided by your instructor, answer the following questions. You may also contact printers in your local area to gather samples of the job tickets they use. Label the job tickets "Job Ticket One," "Job Ticket Two," and "Job Ticket Three."

1. What components are found on all three job tickets?

Assignment Sheet 3

2. What components are unique to Job Ticket One?

3. What components are unique to Job Ticket Two?

4. What components are unique to Job Ticket Three?

5. Select the job ticket you think is the most complete and concise. Explain why you chose this job ticket.

Objective 12

Assignment Sheet 4—Read and Comprehend Information on a Job Ticket

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	**Rating**
• Student followed directions	______
• Student accurately identified all requested information	______
• Assignment was completed on time	______
• Assignment was neat and legible	______

Basic Skills

Reading Writing

Directions

Using the job ticket located on the last page of this assignment sheet, answer the following questions. Write your answers on the blanks provided.

1. What is the customer's name? ______________________
2. What is the customer's address? ______________________

   ____
3. What are the job specifications? ______________________

   ____

   ____
4. What are the typesetting requirements for this job? __________

   ____
5. How many negatives are required for this job? __________
6. What kinds of proofs need to be made for this job? __________
7. List the following information concerning paper to be used: description, size, grain, supplier, and weight. ______________________

   ____

   ____

8. What type of press will be utilized? ____________________

9. How many copies of this job will be printed? ____________________

10. Will any outside vendors be needed to complete this job? __________

11. How will this job be packaged? ____________________

12. How will it be mailed? ____________________

13. Who will the job be shipped to? ____________________

14. Where will the samples be sent? ____________________

____

Job No. 01278

JOB TICKET

Delivery Date:

Invoice to:

Customer WNCO Radio
Address 145 Main Street
City/State/Zip Stillwater, OK 74074
Contact Kathy Phone 555-1234

Date billed
Customer No. 9952
P.O. # 10034
Sales Rep. Misty

Date written 4-3-00
Written by Bob
Date scheduled 4-14-00
Materials purchased 4-3-00

Job Specs.

Item	Quantity	Description	Flat Size	Finish Size	Invoice Amt.
1	20M	Circulars - 3 color - 1 side	8 1/2 x 11	8 1/2 x 11	$798.62

Type/art

☐ Set changes only ☒ Set entire job
☐ Paste-up ☒ Create mechanicals
3 color - one side only

Prep

☐ Exact repeat ☐ Change repeat
☐ Camera ready ☐ Film furnished
3 lineshot negatives
1 halftone negative
3 metal plates

Proofs ☐ None ☐ ____ Blueline(s) ☒ 3 Color Key(s) ☐ ____ Cromalin Proof(s) ☐ _Press Check

Paper

Item	Basis/wgt.	Description	Suppr.	Order In	Due in	No. Sheets	Size/grain	Pieces
1	80#	Warren Lustro	xpedx	3-3	3-6	22M	8 1/2 x 11	22M
		Gloss - White Book					x	
							x	
							x	
							x	
							x	
							x	

Press

Forms	No. Up	Layout	Press	Front Inks	Back Inks	Gross Sheets	Makeready	Waste Allowance
	1	sheetwise	Ryobi	PMS 428	None	20M	2M	2M
			3200	PMS 54:				
				Black				

Bindery

Folding Instructions
None

☐ Saddle stitch on _____ side
☐ Perfect bind on _____ side
☐ Drill _____ holes on _____ side ___ c to s
☐ Trim to size
☐ Pad on _____ size _____ sheets/pad
Other:

Vendor

Vendor Name:
Service Provided:

Mailing

Class Bulk - 3rd
Permit 152
PS Labels
UPS shipper #
Fed Ex shipper #

Packaging

☐ Band
☐ Wrap
☒ Shrink 250's
☒ Box 1,000's
☒ Skids 1/2

Ship to

Ship Via:
Shipping Express
Shipping Address:
WNCO Radio
100 Warehouse Way
Stillwater, OK 74074

Art/Samples

☒ Do not return art.
☒ Send samples to:
Longhorn Advertising
1234 Broadway
Dover, OK 73734

Unit Contents

Student Components

Student Page

Objective Sheet 5–3

Information Sheet 5–5

Assignment Sheets

1—Write a Summary of an Article on Current Printing Processes 5–17
2—Identify Printing Processes Used to Reproduce Different Printed Pieces 5–19
3—Describe the Offset Printing Process 5–21

Job Sheet

1—Test the Ink-Water Principle on an Offset Plate 5–23

Objective Sheet

Unit Objective

After completing this unit, the student should be able to identify the printing process used on printed pieces, identify the components of the offset press, and test the ink-water principle on an offset plate. The student should demonstrate these competencies by completing the assignment sheets and job sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to printing processes with their definitions.
2. Select true statements concerning major printing processes.
3. Arrange in order the principal prepress steps in offset printing.
4. Select true statements concerning the basic offset printing process.
5. Distinguish among the advantages, disadvantages, and uses of the major printing processes.
6. Match the specialized printing processes with their descriptions.
7. Match finishing operations with their descriptions.
8. Name types of material on which printing is done.
9. Name methods of feeding paper into the press.
10. Write a summary of an article on current printing processes. (Assignment Sheet 1)
11. Identify printing processes used to reproduce different printed pieces. (Assignment Sheet 2)
12. Describe the offset printing process. (Assignment Sheet 3)
13. Test the ink-water principle on an offset plate. (Job Sheet 1)

Information Sheet

Objective 1

Terms and definitions

a. **Blanket**—In offset printing, a smooth rubber surface which transfers the image from the plate to the paper

b. **Blanket cylinder**—The cylinder which holds the rubber blanket

c. **Camera-ready copy**—A pasteup ready to be photographed for platemaking

d. **Doctor blade**—In gravure printing, a knife-edged blade pressed against the etched printing cylinder to wipe away the excess ink from the nonprinting areas

e. **Finishing**—A variety of different operations and specialties performed in line with or after printing

f. **Gravure (intaglio)**—A printing process in which the image is etched below the surface of the printing plate

g. **Image area**—That part of the plate which repels water and carries the ink to print the image

h. **Impression cylinder**—The cylinder which applies pressure for image transfer to the paper

i. **Ink fountain**—That part of the offset press that stores and supplies ink to the inking rollers

j. **Letterpress (relief)**—The process of printing from a raised surface

k. **Makeready**—All the work involved in preparing printing materials for a particular job

l. **Nonimage area**—That part of the plate which is bathed in water and carries only the background

m. **Offset** (photo-offset, lithography, offset lithography, planography)—The process of printing from a flat surface with the image and nonimage areas kept separated by chemistry (grease and water don't mix)

n. **Perfecting press**—A printing press that prints both sides of the sheet in one pass

o. **Plate**—A thin sheet of paper, metal, or plastic which carries the image

p. **Plate cylinder**—The cylinder which holds the printing plate

q. **Press sheet**—Receives the right-reading image from the blanket

r. **Sheet-fed press**—A printing press that takes individual sheets of paper rather than rolls of paper

s. **Water fountain**—That part of the offset press that stores and supplies water to the dampening rollers

t. **Web-fed (roll-fed) press**—A press that prints from a roll of paper

Objective 2

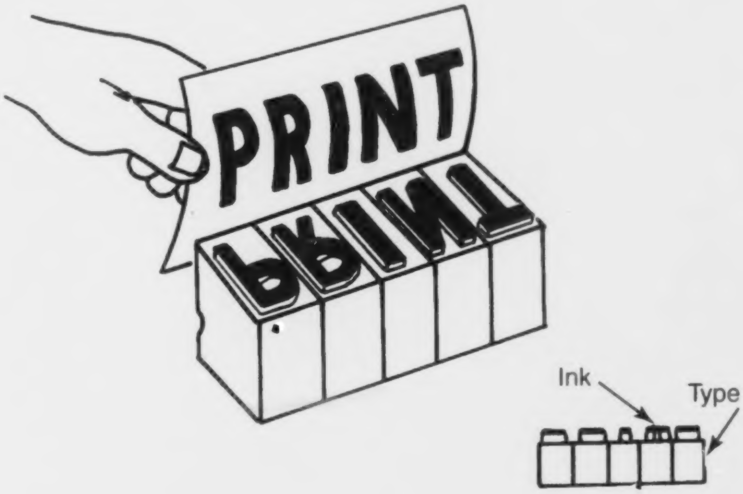
Major printing processes

a. Letterpress (relief)

- The oldest printing method
- The raised image, when inked, is transferred when pressed against paper
- Images are reversed (wrong-reading) on the letterpress plate; when printed, the image is read correctly (right-reading)
- Recognizable by a ring of ink around each letter (seen with a magnifying glass), and a distinct embossing effect where type and other images press into the paper

Note: This punched impression can be seen and felt on the reverse side of the printed page.

Figure 1



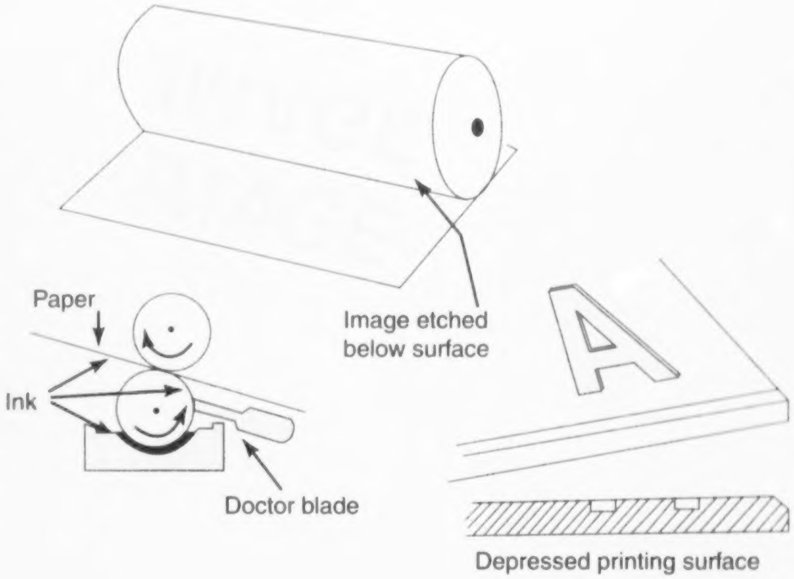
b. Gravure (intaglio)

- Second oldest printing method

  Note: Before the advent of offset printing rotogravure was used extensively for "color sections" of newspapers and magazines.

- The entire surface of the plate or cylinder is inked and then wiped clean with a flexible steel scraper called a doctor blade, leaving ink only in the etched areas to come in contact with the paper to form the printed image.
- Called rotogravure when the presses take paper on rolls rather than in sheets for long press runs
- Recognizable by the fact the entire image area is screened, including the type which can look fuzzy; photographs have good detail with greater contrast between light and dark areas

Figure 2

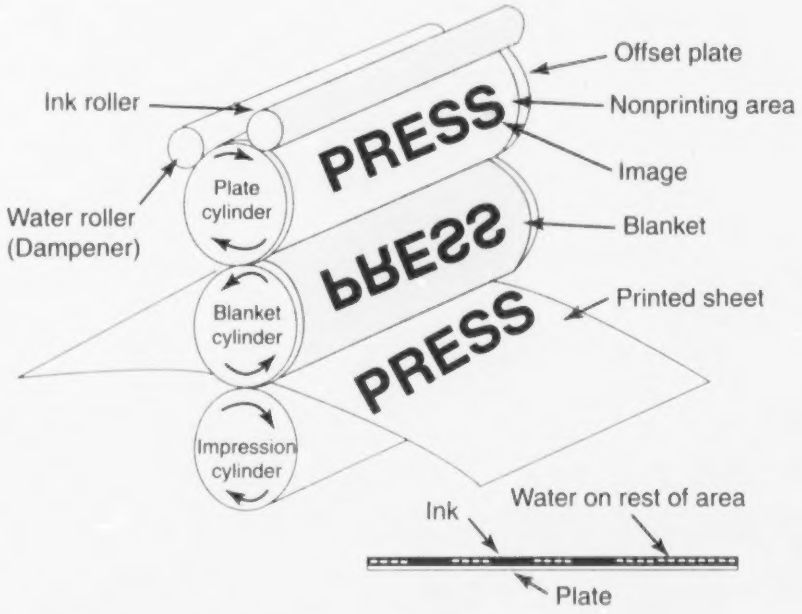


c. Offset (photo-offset, lithography, offset lithography, planography)

- Of the three major printing processes, offset is the newest but the predominant method used today.
- The image is first transferred from a plate to a blanket, then from the blanket to paper.
- Both ink and water (actually, a solution of water, gum arabic and other chemicals) are applied to the plate during the printing cycle.

- Recognizable by a smooth print, as well as by the lack of any impression or ring of ink accompanying type which are characteristics of letterpress and gravure

Figure 3


Offset plate
Ink roller
Nonprinting area
PRESS
Image
Plate cylinder
Water roller (Dampener)
Blanket
PRESS
Printed sheet
Blanket cylinder
PRESS
Impression cylinder
Ink
Water on rest of area
Plate

Objective 3

Principal prepress steps in offset printing

Note: Although the following steps are representative of typical prepress steps in offset printing, and are followed by many printers throughout the world, computerized systems are rapidly being adopted which bypass steps "A" through "F." In these cases "pages" or "print jobs" are created on-screen in a page-layout program. Graphic elements are placed (photos called up from a digital archival system into which photographs were scanned earlier), text is flowed into the proper places, headlines or other graphic elements are created from the keyboard and the finished image on the screen, or "file," is saved to computer disk or CD-ROM. That file is either transmitted via modem, or the disk is physically transported to a computer located in the print shop. There, the file is opened and used to drive a platemaker program which creates an image on a printing plate from the computer program. The plate is then put on the press just as if it had been prepared with the steps included in this (Objective 3) part of the information sheet outline. One can imagine the reduction in labor costs, the reduced opportunities for error, and the reduced amount of physical space required in the prepress area through the use of one of these systems.

a. Original page (camera-ready copy) is created

b. Page "shot" on negative film with process camera

c. Film developed

431

d. Negatives "opaqued" to eliminate undesired spots

e. Negatives stripped into flat (masking sheet or goldenrod)

f. Flat placed over plate and exposed to light

g. Plate developed and put on press

Objective 4

Basic offset printing process

a. The image area of the plate surface is chemically treated to accept ink and reject water.

b. The nonimage area of the plate surface is chemically treated to accept water and reject ink.

c. During the press operation, ink and water are both continually applied to the plate surface.

d. The image is right-reading on the surface of the offset plate.

e. The image is transferred (or offset) from the plate to the blanket.

f. The image on the blanket is a mirror image, or wrong-reading.

g. The blanket carries the image to the printing material.

h. The printing (or impression) takes place as the sheet of paper passes between the blanket cylinder and the impression cylinder.

i. The impression cylinder forces the paper against the blanket causing the image to be printed on the sheet.

j. A clear, clean image is produced by maintaining the proper ink-water balance.

Objective 5

Advantages, disadvantages, and uses of major printing processes

a. Letterpress

- Advantages
    - Capable of printing jobs of a variety of sizes in black and white and in color at high speeds
    - Most versatile method of printing; there is equipment for short, medium, and long runs.
    - For simple rush jobs, printing can be done directly from type.
    - Quality is consistent throughout run.
    - Dense ink gives a strong black image.

  - No ink and water balance is required, so paper waste is often less than for offset (which may require several trial press runs).
  - Almost any size of paper can be printed in single sheets.
  - Accepts papers of any thickness, from the very thinnest to cardboard, depending on the type of press.
  - Proofing is relatively inexpensive and available at any stage.
  - Conversion of paper is easily done because of the press' capacity to press sharp cutting or scoring rules, numbering devices, and metal dies against paper.
- Disadvantages
  - Printed images often are less evenly inked and details somewhat less sharp than with offset.
  - More expensive papers are required to achieve quality of offset.
  - Pictures may cost more than with offset.
  - Makeready on presses is time consuming.
- Uses
  - Short-run printing from type and engravings
  - Jobs requiring numbering (tickets, forms, etc.) and on-press die-cutting, perforating, embossing, etc.
  - Publication work requiring long press runs such as books, newspapers, and magazines as well as many types of specialty printing and packaging

b. Gravure

- Advantages
  - Capable of high-quality, high speed printing of black and white and color jobs
  - Ideal process for reproducing highly faithful copies of photographs
  - Most economical process for long runs (minimum of 100,000; ideally at least 300,000 or more).
  - Quality is consistent throughout run.
  - Capable of printing on a wide range of surfaces
  - Able to lay down a dense layer of ink

    Note: For ink density, silk screen is gravure's only rival.

    - Produces the richest blacks and widest tonal range of all printing processes
    - Plates are more expensive than either letterpress or offset, but they last longer
  - Disadvantages
    - High cost of plates and cylinders make short runs uneconomical.
    - Type is less sharp than if reproduced by offset or letterpress.
    - Proofing is more cumbersome and expensive.
    - Color correction and last minute corrections are difficult and expensive.
  - Uses
    - Large-circulation magazines, high-quality newspaper magazines, and mail-order catalogs
    - Luxurious large-format art and photo books
    - Some kinds of packaging, wallpaper

c. Offset

  - Advantages
    - Capable of printing jobs of a variety of sizes in black and white and in color at a relatively low cost
    - Although the quality is highest on smooth or coated papers, offset can print effectively on rough-surface papers as well.
    - Lends itself to photographic preparation methods; can reproduce anything that can be photographed
    - Able to use all kinds of composition methods, thus keeping typesetting cost to a minimum.
    - Cost-free reproduction of line illustrations and less costly reproduction of photographs of very fine detail are possible.
    - Printing plates are relatively inexpensive and require only a short time to make as compared with letterpress and gravure plates.
    - Plates, flats, and paste-ups are easily stored.
    - Small duplicators are relatively easy to operate.
    - Offers the designer great creative freedom.

- Disadvantages
  - Requires more attention than letterpress or gravure to maintain image consistency throughout run—the balance between ink and water requires skill
  - Color variations occur due to problems with ink-water balance.
  - Waste is usually higher than for other processes.
  - Dense inking is difficult to achieve.
  - Shop humidity and temperature control are more important since paper is exposed to a damp environment on the press.
- Uses
  - Short runs (under 1,000) that involve type and illustrations such as resumes, letterheads, flyers, and newsletters
  - Any moderate (5,000) to medium-long (100,000) runs requiring good photo reproduction such as magazines, newspapers, illustrated books and miscellaneous pieces such as office forms, brochures, and booklets

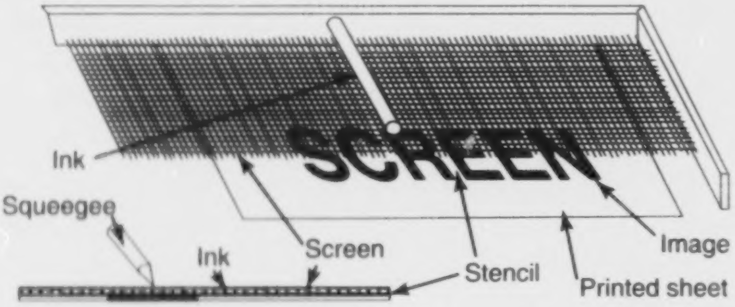
Objective 6

Specialized printing processes

a. Screen printing—A printing method in which the image is transferred to the surface to be printed by means of ink squeezed by a squeegee through a stenciled fabric or metal wire screen stretched over a frame

Note: Screen printing can place a thick layer of ink on almost any material and is excellent for short runs like posters, lawn signs, billboards, bumper stickers, and menu covers.

Figure 4



b. Engraving—Process that reproduces images etched or inscribed into smooth metal

Note: Engraving is used for invitations, announcements and letterheads, envelopes, greeting cards, stamps, money and stock certificates.

c. Flexography—A relief printing method using wrap-around rubber or soft plastic plates and volatile, fast-drying ink

Note: Flexography is widely used in the packaging industry for milk containers, cardboard boxes, gift wraps, and shopping bags.

d. Ink jet—Method of printing by spraying droplets of ink through computer-controlled nozzles

Note: Ink-jet printing is used for direct mail, personalizing business forms, and numbering tickets.

e. Letterset (dry offset)—A printing method in which a low-relief plate is used on a modified offset press; as in conventional offset printing, the ink is transferred from the plate to the paper by being offset from a blanket, but unlike offset printing, no dampening system is required.

Note: Letterset is used in the packaging industry, to print against metal, aluminum, or heavy paperboards.

f. Thermography—A process that starts with copies printed by offset or letterpress with special nondrying inks, and the freshly printed sheets are dusted with resinous powder, then heated, causing the powder to fuse and create a raised surface on the print

Note: Thermography is used for invitations, business cards, and letterheads.

g. Copying—The fastest, most convenient and economical method of duplicating small numbers of copies (less than 100)

- Electrostatic duplication (Xerography)—A copying process produced by electrostatic forces causing a powder (toner) to adhere to the charged image area of the copy
- Spirit duplication—A copying process utilizing a paper spirit master with a carbon image transferring the image to paper when the master is moistened by vapors of duplicating fluid
- Mimeograph duplication—A direct-plate copying process that employs a typed or handwritten stencil mounted on a cylinder filled with ink which flows through the holes (image area) onto the paper

h. Digital printing—Any reproduction technology that receives electronic files and uses spots (or dots) for reproduction. An ink, toner, ink jet, or any other dye or pigment-based transfer system may be used.

Note: Prior to computerization, the production of printed materials did not lend itself to complete integration. However, the application of digital technology to all aspects of the workflow has reduced the number of steps and made the process simple and more productive.

- Computer-to-imagesetter—Technology that involves the electronic creation of materials up to the output of film by the imagesetter. Once the film is created, traditional platemaking and printing processes are carried out.
- Computer-to-plate—Technology that utilizes imaging systems that take fully paginated digital materials and expose this information to plates in platesetters or imagesetters without creating film intermediates. CTP is also referred to as direct-to-plate or digital-to-plate.
- Computer-to-press—Technology that prints images directly on the press from electronic files. This type of printing eliminates the time-consuming and costly preparation of film, plates, and inks. Though not without limitations, computer-to-press technology brings professional printing closer to the desktop with quick turnaround and cost effective four-color process short runs. Totally Electronic Printing (TEP) uses a reimageable image carrier or no image carrier for the transfer of ink-jet ink or toner to the paper. TEP usually uses pixels (bitmapped images) for printing.

Objective 7

Finishing operations

a. Die-cutting—The process of cutting special shapes into printed sheets, sometimes by dies that look and perform much like a cookie cutter

b. Embossing—Impressing an image in relief to achieve a raised surface, either over printing or on blank paper (called blind embossing)

c. Foil stamping—Applying a thin layer of colored foil to the printed material with a heated stamp or die

d. Numbering—Printing consecutive numbers on invoices, tickets, etc. with a numbering machine

Note: Numbering is usually done by letterpress, although some offset presses have numbering attachments. Embossing and foil stamping are the domain of the letterpress, which impacts the paper with type. This direct contact is used with proper press accessories to emboss or stamp hot foil surfaces on the paper.

e. Perforating—Punching a line of minute holes in a sheet so that a part may be easily torn away

Note: In letterpress, perforating is done on press; in offset or gravure, it is usually done off press.

f. Scoring—Creasing paper so it will fold more easily

Note: Scoring is usually done in the folder.

Objective 8

Types of material on which printing is done

a. Paper
b. Wood
c. Glass
d. Cloth
e. Metal
f. Rubber
g. Plastic
h. Leather

Objective 9

Methods of feeding paper into the press

a. Sheet feeding

- The "feeder" section of the press picks up the sheets, usually with a combination of metal fingers and vacuum suckers, and feeds them through to be printed.
- The sheets are delivered from the press as flat sheets.

b. Web feeding

- Front end of press has a rollstand, which holds the roll of paper as it is unwound and fed through the press; printing can take place at much higher speeds because the machine is not slowed down by having to pick up and put down each sheet.
- Most web presses incorporate some form of finishing process such as cutting and folding.

Objective 10

Assignment Sheet 1—Write a Summary of an Article on Current Printing Processes

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Summary includes discussion of disadvantages and advantages of selected printing process	______
• Summary was neat and completed on time	______

Basic Skills

Reading Writing Critical Thinking

Introduction

In today's world, technology changes rapidly. It is important for graphic art employees to stay abreast of current printing processes.

Directions

Use the Internet and periodicals found in your facility and local library to locate at least one article concerning a current printing process such as digital printing. Read the article(s) and write a short summary on a separate sheet of paper. In your summary, discuss the advantages and disadvantages of this printing process.

Below are a few resources you might want to utilize in your research.

Graphic Arts Monthly
www.gammag.com

American Printer
www.americanprinter.com

Desktop Publishers Journal
www.dtpjournal.com

Publish
www.publish.com

Objective 11

Assignment Sheet 2—Identify Printing Processes Used to Reproduce Different Printed Pieces

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Provided appropriate samples of letterpress, gravure, offset, and specialized processes	______
• Scrapbook is neat and legible	______

Basic Skills

Reading Writing Critical Thinking

Directions

Make a scrapbook of printed pieces to illustrate the various kinds of printing processes. For instance, include samples of offset, letterpress, gravure, and as many of the specialized processes as you can find. Explain how you identified each sample.

Objective 12

Assignment Sheet 3—Describe the Offset Printing Process

Name ______________________ Overall Rating __________

Date ______________________

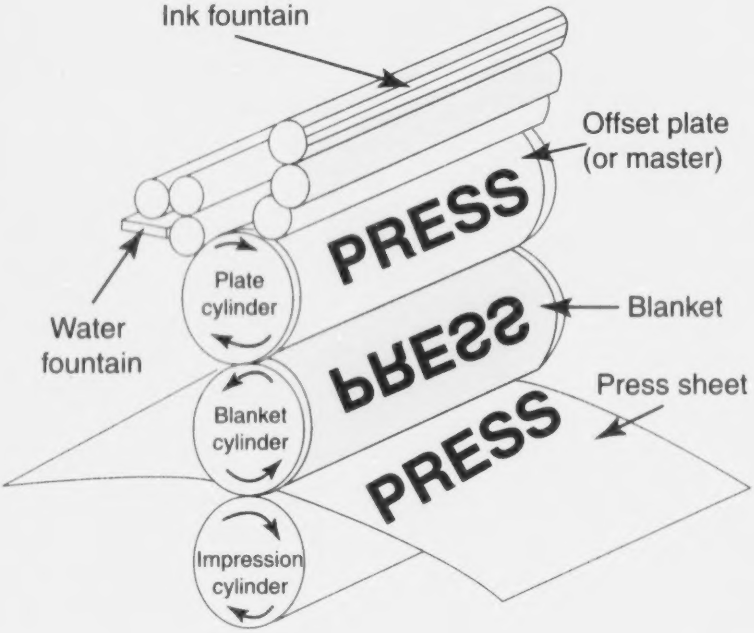
Evaluation Criteria	Rating
• Directions were followed	______
• Correctly identified parts and described their functions	______

Basic Skills

Reading Writing

Directions

In the blanks on the next page, describe the functions of each component in the offset process as depicted in the following illustration.


Ink fountain
Offset plate (or master)
PRESS
Plate cylinder
Water fountain
PRESS
Blanket
Blanket cylinder
Press sheet
PRESS
Impression cylinder

Assignment Sheet 3

1. Ink fountain ______________________________

2. Water fountain ______________________________

3. Plate cylinder ______________________________

4. Blanket cylinder ______________________________

5. Impression cylinder ______________________________

6. Offset plate ______________________________

7. Blanket ______________________________

8. Press sheet ______________________________

445

Objective 13

Job Sheet 1—Test the Ink-Water Principle on an Offset Plate

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Directions were followed	______
• Placed plate on table with image up	______
• Wiped plate clean with wet cotton	______
• Applied ink to cotton and rubbed plate thoroughly	______
• Recorded what happened to image area of plate and nonimage area	______
• Cleaned and gummed plate	______
• Returned plate to instructor, checked in tools, cleaned work areas	______
• Performed steps in safe, timely manner	______
• Provided satisfactory responses to questions asked	______

Basic Skills

Reading Writing Science Critical Thinking

Introduction

The chemical basis for offset printing is the fact that "oil and water do not mix." In this job sheet you will receive first-hand experience of how oily ink and water separate on a sensitized plate to provide an inked image area and "watered" background.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- Developed offset plate
- Two cotton pads
- Thimble-size portion of black ink
- Clean work table
- Water bottle
- Clean-up solvents
- Preservatives

Procedure

☐ 1. Lay plate on table with image up.

☐ 2. Wet cotton pad and wipe plate clean.

☐ 3. Apply small quantity of ink to wet cotton pad.

BEST COPY AVAILABLE

- ☐ 4. Rub plate thoroughly with the inked, wet cotton pad.
- ☐ 5. Write down on a sheet of paper what happened to the image area of the plate.
- ☐ 6. Write down what happened to the nonimage area of the plate.
- ☐ 7. Turn sheet in to instructor.
- ☐ 8. Clean and gum plate.
- ☐ 9. Clean up work area and return tools and materials to proper storage.

Evaluator's Comments: ____________________________________

____

____

447

Unit 6 Paper

Unit Contents

Student Components

Student Page

Objective Sheet 6–3

Information Sheet 6–5

Assignment Sheets

  1—Identify Basic Grades of Paper 6–13
  2—Choose the Correct Paper for Various Jobs 6–15
  3—Select and Order Paper Utilizing a Paper Cabinet and Paper Price Book 6–17

Objective Sheet

Unit Objective

After completing this unit, the student should be able to select appropriate kinds of paper for various print jobs. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to paper with their definitions.
2. Match the basic paper grades with their uses.
3. Match the basic paper sizes with their dimensions.
4. Name factors affecting paper choice.
5. Describe tests and procedures for determining grain direction.
6. Select true statements concerning printing process requirements.
7. List information to specify when ordering paper.
8. Match commercial envelope number sizes with their dimensions.
9. List rules for handling paper.
10. Identify basic grades of paper. (Assignment Sheet 1)
11. Choose the correct paper for various jobs. (Assignment Sheet 2)
12. Select and order paper utilizing a paper cabinet and paper price book. (Assignment Sheet 3)

Information Sheet

Objective 1

Terms and definitions

a. **Basic size**—The size adopted over time as standard for each type or grade of paper

b. **Basis weight**—The weight in pounds of 500 sheets of paper cut to a given standard size for that grade

Note: Basis weight may also be known as "substance."

Example: For book grades, paper stock is "70 pound" if 500 sheets 25 by 38 inches weigh 70 pounds.

c. **Brightness**—Characteristic of paper referring to how much light it reflects

d. **Bulk**—Thickness of paper, expressed in sheets per inch

e. **Calendaring**—A rolling operation during papermaking that creates the amount of smoothness in paper

f. **Caliper**—Thickness of a sheet of paper, usually measured in thousandths of an inch

g. **Color**—Pigment or shade of paper

Note: Paper is available in virtually every color and also in a wide range of whites.

h. **Felt side**—The smoother side of the paper that was on the felt blanket of the papermaking machine

i. **Fiber**—Wood pulp reduced to wood or cellulose fibers, the basic ingredient of paper

j. **Finish**—Surface characteristic of paper that affects look, feel, and printability

k. **Grain**—The direction the fiber runs in paper

Note: Knowing the grain of paper is important for printing, folding, and binding.

l. **Opacity** (show-through)—The property of paper that helps prevent printing on one side from showing on the other

Note: The more opaque the paper, the less show-through will occur.

m. **Printability**—The ability of a paper to take print adequately without problems

n. **Ream**—500 sheets of paper

Note: Most business papers are packaged in reams.

o. **Recycled**—Paper produced from collected waste paper

Note: Recycled paper comes in all grades and colors, and may have greater flexibility and greater opacity than nonrecycled papers.

p. **Runability**—Properties that affect the ability of the paper to run on the press such as tensile strength, stretchability, defects, moisture content, etc.

q. **Watermark**—Distinctive design created in paper during manufacture

r. **Wire side**—The side of paper next to the screen on the papermaking machine

Objective 2

Uses of basic paper grades

a. **Writing**—Used for letterheads, business forms, certificates, checks, flyers, resumes, photocopies

- Bond
- Ledger
- Safety
- Business

b. **Book**—Used for books, booklets, brochures, magazines, newsletters, flyers, posters, programs, announcements

- Uncoated
- Text
- Coated

  Note: Coated papers may come in matte, gloss, dull, and cast coated.

- Offset

c. **Cover**—Used for covers on booklets, business cards, menus, folders, table tents, tickets, invitations, business reply cards

d. **Card stock**—Used for file folders, covers, postcards, tags, signs, point of purchase displays

- Bristol
- Index
- Tag
- Blanks

e. **Newsprint**—Used for newspapers, flyers, circulars

f. **Specialty papers**—Used for directories, direct mail pieces, fly leaves, forms, bags, labels, stickers, banners, maps

- Lightweight

  Examples: Manifold, onionskin, Bible

- Translucents
- Carbonless

  Note: Carbonless paper is also known as "NCR" or "No Carbon Required."

- Kraft
- Gummed
- Pressure-sensitive
- Label
- Synthetic

Objective 3

Dimensions of basic paper sizes

a. Bond—17″ by 22″

b. Book—25″ by 38″

c. Cover—20″ by 26″

d. Bristol—22 1/2″ by 28 1/2″

e. Index—22 1/2″ by 35″ and 25 1/2″ by 30 1/2″

f. Tag—24″ by 36″

g. Newsprint—24″ by 36″

Objective 4

Factors affecting paper choice

a. Grain

b. Weight

c. Size

d. Bulk

e. Opacity

f. Color

g. Finish

h. Price

Note: Paper represents a major production cost.

i. Availability

j. Reproduction quality

k. Durability

l. Chemical and physical properties that affect presswork, folding, and binding

m. Production equipment to be used

n. Suitability for scoring, embossing, die-cutting

o. Psychological factors

Example: Environmental groups prefer recycled paper.

p. Postal Service guidelines

q. Mailing costs

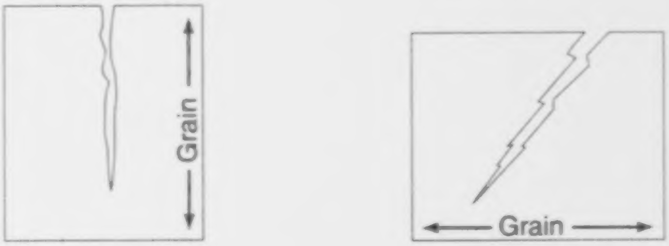
Objective 5

Tests and procedures for determining grain direction

a. Bending—Hold a sheet first at one edge, then the other; the side producing the greatest sag is the direction of the grain.

b. Tearing—Tear a sheet from the end and from the side; the cleanest tear is with the grain direction.

Figure 1

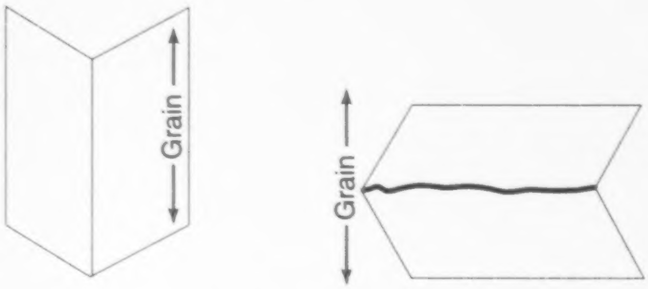


Paper tears straighter with grain.

453

c. Folding—Fold and crease paper sharply in both directions; the smoothest crease is with the grain.

Figure 2



Paper folds more easily with grain.

d. Wetting—Wet sheet; paper rolls with the direction of grain.

Objective 6

Printing process requirements

a. Letterpress papers should be smooth (so that uneven impression is prevented) and free from lint and dust.

b. Gravure papers should be extremely smooth and have a certain amount of absorbency.

c. Offset papers require moisture resistance; they should have good surface strength and be lint-free.

d. Screen printing papers require resistance to change in dimensions under heat drying conditions.

Objective 7

Information to specify when ordering paper

a. Quantity

Note: Paper can be bought in sheet or roll form.

b. Size

c. Grain direction

Note: When ordering paper, underline dimension to indicate grain direction, i.e. 5,000 sheets, 23 x 35, 80# etc.

d. Weight

e. Color

f. Brand name

g. Texture or finish

h. Grade

Note: Additional information might include C1S and C2S for "coated one side" and "coated two sides;" Duplex or Duo for paper with different color or finish on each side; gummed; pressure-sensitive; NCR, etc.

Examples:
5,000 sheets, 23 x 35, 80# sand Wausau Astro Parche text
2,000 sheets (4 reams), 8 1/2 x 11, 24# Beckett Cambric Gray writing
600 sheets, 25 x 38, 8 pt., WarrenFlo cover
1,500 sheets, 20 x 26, 60# white High Gloss Fasson Crack'n Peel label
1,920 lb. (6 rolls), 11 inch, 60#, white wove Hammermill offset opaque

Objective 8

Commercial envelope number sizes and dimensions

a. 6 1/4 size—Dimensions 3 1/2" x 6"

b. 6 3/4 size—Dimensions 3 5/8" x 6 1/2"

c. 7 size—Dimensions 3 3/4" x 6 3/4"

d. 7 3/4 size—Dimensions 3 7/8" x 7 1/2"

e. Monarch size—Dimensions 3 7/8" x 7 1/2"

f. Check size—Dimensions 3 5/8" x 8 5/8"

g. 9 size—Dimensions 3 7/8" x 8 7/8"

h. 10 size—Dimensions 4 1/8" x 9 1/2"

i. 11 size—Dimensions 4 1/2" x 10 3/8"

j. 12 size—Dimensions 4 3/4" x 11"

k. 14 size—Dimensions 5" x 11 1/2"

Note: The two most common envelope sizes are #6 3/4 business envelopes and #10 business envelopes.

Objective 9

Rules for handling paper

a. Keep paper flat.

b. Never drop paper cartons.

c. **Do not** store paper in direct sunlight.

d. Stack paper on pallets instead of on concrete floors.

e. Cover pallets (skids) with plastic (skid covers).

f. Cover paper after coming off the press overnight and before it goes to bindery.

g. Reseal opened reams and cartons.

h. Allow incoming paper to adjust to temperature and humidity conditions in the plant.

i. Keep all stock marked; **do not** destroy paper package labels.

j. Use oldest stock first.

k. Use proper equipment to lift papers.

Objective 10

Assignment Sheet 1—Identify Basic Grades of Paper

Name ____________________ Overall Rating __________

Date ____________________

Evaluation Criteria	Rating
• Directions were followed	______
• Scrapbook includes examples of six grades of paper	______
• Participated in examinations of paper	______
• Demonstrated satisfactory performance to instructor	______

Basic Skills

Reading Critical Thinking

Materials list

- Objective 2 of Information Sheet
- Samples of each grade of paper
- Magnifying glass
- Pen or pencil

Directions

Obtain (from your instructor, a printer, or paper wholesaler) examples of each grade of paper. (Refer to Objective 2 of the Information Sheet.)

1. Make a scrapbook with samples of each grade of paper. Label the samples. Learn to recognize each grade by sight and touch.

2. Examine some of your samples. Using a magnifying glass, determine the felt side and the wire side of the sheets.

3. Fold a few of your sheets of paper with and against the grain. Note the differences, if any.

Objective 11

Assignment Sheet 2—Choose the Correct Paper for Various Jobs

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Selections were appropriate for uses specified	______

Basic Skills

Reading

Critical Thinking

Materials list

- Various types of paper stock

Directions

Examine an assortment of paper. Select a paper stock that would be most suitable for the following:

1. Letterhead for your school
2. A business card for a lawyer
3. An invitation to a reception in honor of a mayoral candidate
4. A direct mail piece for a new pizza restaurant
5. A circular for a grocery store
6. A sales brochure for a new apartment complex
7. A newsletter for a hospital

Objective 12

Assignment Sheet 3—Select and Order Paper Utilizing a Paper Cabinet and Paper Price Book

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Utilized a paper cabinet to select appropriate paper for the job	______
• Utilized price book to complete purchase order with proper specifications	______
• Paper order is neat, orderly, and complete	______
• Math is accurate	______

Basic Skills

Reading Writing Mathematics Critical Thinking

Introduction

A good way to become familiar with different types of paper is to utilize a paper cabinet provided by a paper supplier to select paper for a variety of jobs. Ask your instructor for a paper cabinet and paper price book to complete this assignment.

Materials list

- Paper company price book (provided by instructor)
- Calculator
- Paper sample cabinets (provided by instructor)
- Ball point pen (black or blue)

Directions

Complete the purchase order located at the end of this assignment sheet by following the directions outlined in this assignment.

1. Using the paper cabinet samples, select paper for the following:

    a. 1,000 letterheads for a physician's office (8 1/2 x 11)

    b. 5,000 flyers for a basketball camp (8 1/2 x 11)

    c. 10,000 posters for a high school football schedule (11 x 17 heavy cardstock—bright)

    d. 20,000 brochures for a nursery school (8 1/2 x 14 economical yellow paper)

    e. 2,500 forms for a fishing tournament (8 1/2 x 11 blue paper)

2. Use the paper price book to complete the purchase order located at the end of this assignment sheet. Be sure to include the name and address of the paper company on the purchase order.

   Note: See the sample purchase order on the next page for more information about the following items.

   a. Quantity—Indicate the quantity of paper desired.

      Example: "10" on the sample indicates that 10,000 envelopes will be ordered.

   b. Unit—Place an "M" in the Unit column. M stands for thousand. Most paper is priced and sold by the thousands. If you are ordering less than a thousand, use decimals to indicate the percentage. (i.e. 500 would be .5M)

   c. Product Number—Locate the product number in the paper price book and place it in this column. Be cautious not to transpose this number.

      Note: Most suppliers prefer that customers order by product number.

   d. Description—List all specific paper information including size, name, color, brand, grade, grain direction, and texture or finish (if applicable) in this column. Be sure to underline the grain direction.

   e. Unit price—Unit price is the price per thousand. You will find this in the paper company price book.

   f. Extended price—Extend your price for the quantity ordered. To obtain an extended price, use the following formula: Quantity ordered x the unit price.

      Example: On the sample purchase order, 10 M x 47.71 = $477.10

   g. Subtotal—Add the extended prices for each item.

   h. Tax—Use your local sales tax to figure the tax. To figure the tax, use the following formula: Subtotal x local tax.

      Example: If the subtotal was $300.00 and your local tax was 8%, take $300.00 x .08 for a tax total of $24.00.

   i. Total—To figure the total, add the subtotal and tax. This is the total amount you would be charged for the paper order.

3. Sign your purchase order.

4. Submit your purchase order to the instructor for evaluation.

Graphic Arts Class
1201 Printing Lane
Cleveland, OH 10022
(213) 555-1234

PURCHASE ORDER

TO: Northeast Paper Co.
P.O. Box 2505
Columbus, OH 12004

SHIP TO: Graphic Arts
1201 Printing Lane
Cleveland, OH 10022

Date	P.O. Number	Ship Via
2-25-03	60823	U.S.Mail

Quantity	Unit	Product #	Description	Unit Price	Extended Price
10	M	110465	#10-24 Glacier Mist	47.71	477.10
			Beckett Cambric Envelopes		
5	M	262785	$8^1/_2$ x 11 3 Part Sup. NCR	22.31	111.55

SAMPLE

Note—This is a teaching tool. It is not a negotiable product.

Sub Total	588.65
Tax	47.09
TOTAL	635.74

Student Signature Sample Student

Assignment Sheet 3

Graphic Arts Class
1201 Printing Lane
Cleveland, OH 10022
(213) 555-1234

PURCHASE ORDER

TO: ______________________________ SHIP TO: ______________________________

______________________________ ______________________________

______________________________ ______________________________

Date	P.O. Number	Ship Via

Quantity	Unit	Product #	Description	Unit Price	Extended Price

Note—This is a teaching tool. It is not a negotiable product.

Sub Total	
Tax	
TOTAL	

Student Signature ______________________________

BEST COPY AVAILABLE

Unit Contents

Student Components

Student Page

Objective Sheet 7–3

Information Sheet 7–5

Assignment Sheets

1—Identify Typeface Classes in Printed Material 7–17
2—Measure Type 7–19
3—Identify Formats of Type Composition 7–21

463

Objective Sheet

Unit Objective

After completing this unit, the student should be able to measure type and identify parts of a type character, typefaces and formats of type composition. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to typography with their definitions.
2. Identify parts of a type character.
3. Identify classifications of typefaces.
4. Complete statements concerning type families.
5. Complete statements concerning the measurement of type.
6. Identify formats of type composition.
7. Identify typeface classes in printed material. (Assignment Sheet 1)
8. Measure type. (Assignment Sheet 2)
9. Identify formats of type composition. (Assignment Sheet 3)

Information Sheet

Objective 1

Terms and definitions

a. **Ascender**—The part of a lowercase letter that rises above the x-height, as in b, d,f, h, k, l,and t

b. **Body type**—Type 12 points and smaller

Note: This is also referred to as *text type*.

c. **Characters**—Individual letters, numerals, punctuation marks or other symbols

d. **Descender**—The part of a lowercase letter that goes below the x-height, as in g, j, p, q, and y

e. **Dingbat**—A typographic decorative device such as a bullet or star

f. **Display type**—Type 14 points or larger

g. **Family**—All the typestyles of a particular typeface

Examples: Normal, *italic*, and **bold**

h. **Font**—All the characters of a particular typeface

i. **Kerning**—Adjusting the letterspacing between certain letters to bring them closer together and create uniformity

Note: Kerning is often called *set with minus letterspacing*.

j. **Leading**—The space between lines of type

Note: Leading is pronounced "ledding."

k. **Letterspacing**—Amount of space between letters

l. **Line gauge**—Printer's ruler that is calibrated in picas, points, and inches

m. **Lowercase**—Small letters of the alphabet

Note: *Uppercase* and *Lowercase* are terms derived from the days of hand-set lead type when a printer kept type in a specially divided wooden box ("California job case") with specific compartments for each letter of the alphabet. The upper portion of the case contained the capital letters and the lower portion—the one much easier to reach for most text type—contained the smaller, or "lowercase" letters.

n. **Measure**—The width of a line of type

o. **Pica**—Unit of measurement equaling approximately 1/6 of an inch or 12 points

p. **Point**—Unit of measurement equaling approximately 1/72 of an inch or 1/12 of a pica; used to express type size or leading

q. **River**—Distracting pattern of white space running vertically down through body copy

r. **Serifs**—Short cross-strokes that project out at the end of the main letter strokes in some typefaces

s. **Small caps**—Capital letters that are the same size as the x-height of the typeface

Example: SMALL CAPS

t. **Straight matter**—Body type set in normal paragraph form in contrast to tabular matter

u. **Tabular matter**—Charts, tables, formulas, or other elements that make typesetting complicated and time consuming

v. **Type**—Characters used singly or collectively to create words, sentences, paragraph, blocks of copy, etc.

w. **Typeface**—A particular style or design of type

x. **Type size**—The height of a typeface measured from the bottom of its descenders to the top of its ascenders

y. **Typography**—The art and science of working with type

z. **Uppercase**—Capital letters of the alphabet

aa. **Widow**—End of a paragraph or column that is undesirably short

bb. **Wordspacing**—Amount of space between words

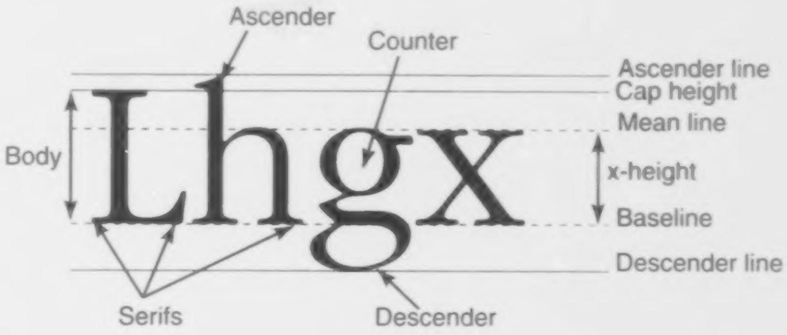
cc. **x-height**—The distance between the baseline and mean line of type; the height of a lowercase letter excluding the ascenders or descenders

Objective 2

Parts of a type character

a. Different parts of a type character have certain names

Figure 1


Ascender
Counter
Ascender line
Cap height
Mean line
Body
Lhgx
x-height
Baseline
Descender line
Serifs
Descender

b. Most important parts are ascender, descender, and serif

- Ascenders and descenders help determine body size
- Serifs help identify typefaces

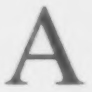
Objective 3

Classifications of typefaces

a. **Roman**

- Variations include old style, modern, and transitional
- All have serifs
- All have both thick and thin strokes
- Also called "serif"
- Suitable for almost any application

Figure 2—Roman



467

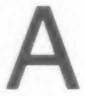
b. **Sans serif**

- Also known as Gothic or grotesque

  Note: The French word *sans* means *without*, thus the term sans serif means without serifs.

- All strokes are nearly uniform
- Simplest of all typeface designs
- Popular for publication headings, posters, and advertising designs

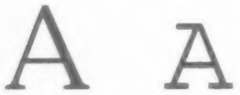
Figure 3—Sans Serif



c. **Square serif**

- Has blocked or squared serifs
- Consists of uniform strokes
- Sometimes called "block" style or "slab serif"
- Popular in advertising

Figure 4—Square serif

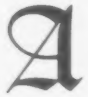


d. **Text**

- Has a heavy, bold appearance
- Styled after ornate hand lettering used more than 500 years ago
- Also called Old English or black letter
- Should not be set in all capital letters, as it is very difficult to read

- Used for newspaper nameplates, announcements, certificates

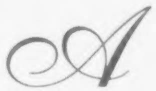
Figure 5—Text



e. **Script**

- Has handwritten or hand-lettered effect
- Popular for announcements and invitations
- Also known as "cursive"
- Should not be set in all capital letters, as it is very difficult to read

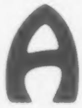
Figure 6—Script



f. **Novelty**

- Consists of unusual designs that command attention
- Used for display lines only, as it generally is not legible in small sizes
- Creates a sense of mood, time, or decorative effect
- Also called "decorative" or "specialty"

Figure 7—Novelty



Objective 4

Type families

a. Each classification of typeface consists of subgroups, called families.

Example: The sans serif group includes such families as Helvetica, Futura, and Avant Garde.

b. Type is ordered by family name.

c. Families may have a number of variations involving weight, width, and posture.

Note: A few typefaces offer such variations as shaded, shadowed and outlined, but these are not usually thought of as family variations; instead, they may be classified as novelty.

- Weight variations refer to typestyles designed with thinner or thicker strokes, such as light, demibold, bold, and extrabold.

  Note: Boldface is the most common weight variation.

- Width variations refer to the condensing (narrowing) and extending (widening) of the letters.

- Posture refers to upright and italic.

  Note: Typefaces that are slanted to their right are referred to as *italic* in contrast to normal, upright posture. Trade practice dictates that upright is assumed unless typesetting specifications state otherwise.

Figure 8

Helvetica Light	ABCDEFGHIJKLMNOPQRSTUV
Helvetica Light Obl	*ABCDEFGHIJKLMNOPQRSTUV*
Helvetica Narrow	ABCDEFGHIJKLMNOPQRSTUV
Helvetica Narrow Oblique	*ABCDEFGHIJKLMNOPQRSTUV*
Helvetica	ABCDEFGHIJKLMNOPQRSTUV
Helvetica Bold	**ABCDEFGHIJKLMNOPQRSTUV**
Helvetica Oblique	*ABCDEFGHIJKLMNOPQRSTUV*
Helvetica Bold Obl	***ABCDEFGHIJKLMNOPQRSTUV***

Objective 5

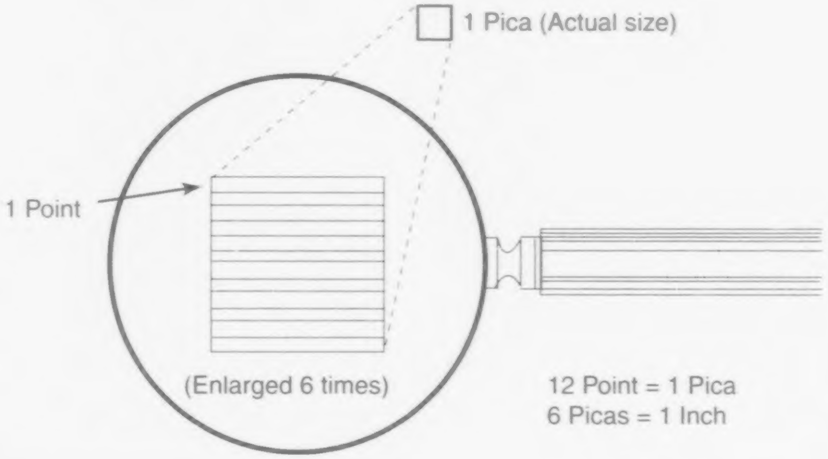
Measuring type

a. **Units of measurement**

- Point
  - — Smallest unit of measurement
  - — Used to measure type body size and leading
  - — Approximately 1/72 of an inch

- Pica
  - Equal to exactly 12 points
  - Used to measure line length, depth of columns, size of margins, size of illustrations
  - Six picas equal approximately one inch

Figure 9

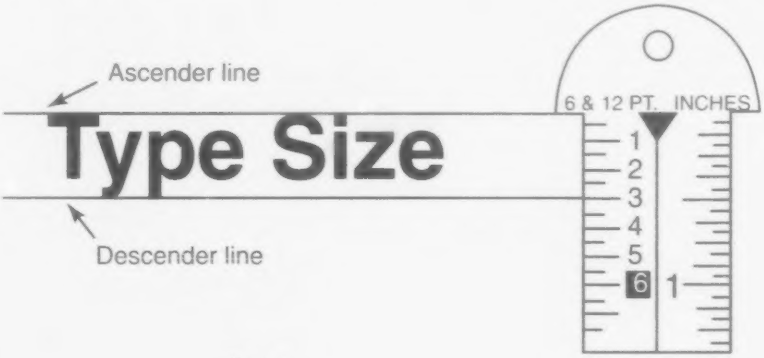

1 Pica (Actual size)
1 Point
(Enlarged 6 times)
12 Point = 1 Pica
6 Picas = 1 Inch

b. **Type size**

- Refers to height of the particular type
- Measured in points, with a line gauge
- Measured from the bottom of descenders to the top of ascenders

Note: Type 12 points or smaller is known as *body* or *text* type, while type 14 points or larger is known as *display type*. The most widely used sizes range from 6 points to 72 points.

Figure 10


Ascender line
Type Size
Descender line
6 & 12 PT.
INCHES
1
2
3
4
5
6
1

BEST COPY AVAILABLE

c. **Line length**

- Also known as *measure* or *column width*
- Measured in picas, with a line gauge
- For body copy, should be approximately $1\frac{1}{2}$ times the type size being used

  Note: This allows for optimum readability.

  Example: 10 point type should be set 15 picas wide.

d. **Line depth**

- Measured from baseline to baseline
- Measured in points, with a line gauge

e. **Leading**

Note: "Leading" is a term left over from the time when letterpress type was cast from molten lead. Therefore, to "lead" a line, was to add material between lines of type, giving them more space for easier readability. Today, the term is still used, although rarely is any type cast from hot lead.

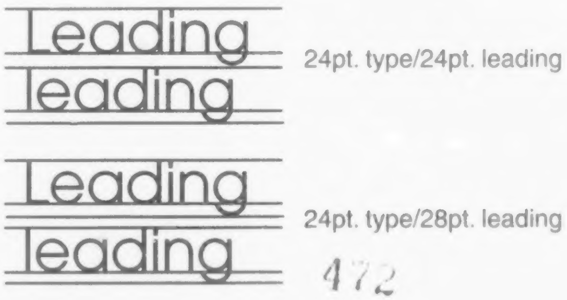
- Space between lines of type; measured from descender line to ascender line

  Note: Leading equals line depth minus type size.

- Affects appearance and readability of copy
- Measured in points, with a line gauge
- Leading of 0 to 2 points for body type is common practice in the industry

  Note: *Set solid* means set without leading, i.e., 12 point type set with 12 point line depth. Modern typesetting equipment can set one line of type on top of another, called *negative leading*, but it is seldom appropriate.

Figure 11



472

f. **Horizontal spacing**

- Wordspacing—Amount of spacing between words

  Note: This is now done automatically by page-layout software.

- Letterspacing—Amount of spacing between letters of a word

  Figure 12

  LETTERSPACING
  -5

  LETTERSPACING
  Normal

  LETTERSPACING
  +5

  LETTERSPACING
  +10

  LETTERSPACING
  +20

- Indentation—White space set in a fixed interval from the margin to separate paragraphs

  — The most common indentation is 1 em.

  Note: An em is a square of the type size being set; for example, a 10-point em is 10 points wide and 10 points high.

- When paragraph indentations are not used at all, extra line space is left between paragraphs.

  Note: These are referred to as *block paragraphs.*

- Hanging indents are paragraphs in which the first line is set flush left and subsequent lines are indented, usually 2 or 3 ems.

- Initial letter indentation is done to accommodate an oversized character that begins the first word of a body of copy for decoration or emphasis.

  Figure 13

  Initial letter indentation allows space to accommodate an oversized character at the beginning of a body of copy to emphasize or provide a decorative effect.

Information Sheet

Objective 6

Formats of type composition

Note: Formats are ways of arranging lines of type.

a. **Centered**

- Aligned at the mid-line
- Spaced equal distance from both ends of each line
- Used mostly for display type or body type in advertisements

Figure 14

LAMPS

for photographic equipment
send for our complete list of all ANSI
coded lamps manufactured in the U.S. for
audiovisual, photo, and studio use.

b. **Flush left**

- Also known as *ragged right* or *quad left*
- All lines are aligned on the left end and are ragged on right end

Figure 15

And, whether you choose condenser illumination, diffusion, or a
powerful dichroic color head, you'll find that the illumination is
incredibly even, corner-to-corner.

c. **Flush right**

- Also known as *ragged left* or *quad right*
- All lines are aligned at right end
- Lines begin randomly on left end

Figure 16

When you need lots of light for lots of depth of field, Broncolor's
got it. The incredibly efficient Broncolor 606 gets a guide
number for 945 out of 6,000 watt seconds, for an aperture of
f/157 at 6 feet with ASA 100 film, with 55° standard reflector.

d. **Justified**

- All lines are even, or flush, at both ends
- Indentation may, or may not, be used for first line of paragraph

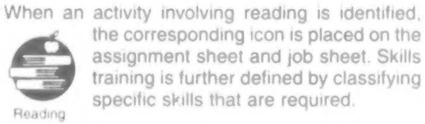
Figure 17

The third area of potential stress touched on in these articles revolves around the delegation of tasks, as discussed by Donald Haws. Although few managers doubt the logic of the "anti-instinctive" aspects of the managerial role, the difficulty arises when the necessity occurs to do it.

e. **Runaround**

- Lines are shortened where needed to go around an illustration or photo
- May be part of another format

Figure 18



When an activity involving reading is identified, the corresponding icon is placed on the assignment sheet and job sheet. Skills training is further defined by classifying specific skills that are required.

- May be contoured to fit around an irregularly shaped illustration (contoured wrap)

f. **Molded**

- Body type formed into a distinctive shape

Example: Word search puzzles are often printed in shapes.

- Can be distracting and hard to read

g. **Tabular**

- Also known as *multiple justification*
- Figures or letters are set in columns across the page

Figure 19

	Percent Reporting Expenditure	Average Expenditure	Total Expenditure
Purchased Equipment, Materials or Services	96.3 %	$30,728	$1,250,470,600
Equipment			
Purchasing	84.0	12,460	442,320,500
Rental	91.1	1,435	11,583,100

h. **Ruled form**

- Cross-ruled part of form may be done separately
- May be part of another format

Figure 20

Fold Plate	W S	
	Depth	Width
A	12 3/4"	14"
B	10	14
C	8 1/2	10
D	8 1/2	10
E	8 1/2	10
F	8 1/2	10

Objective 7

Assignment Sheet 1—Identify Typeface Classes in Printed Material

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Collection includes examples of the six classes of typefaces	______
• Collection is neat, orderly, and complete	______

Basic Skills

Reading Critical Thinking

Introduction

A good way to become familiar with typefaces is to identify examples in magazines, newspapers, and other publications.

Materials list

- Paper
- Pen
- Magazines, newspapers, etc.

Directions

Collect as many examples of the six different classifications of typefaces listed below as possible. Paste these on separate sheets and label with the appropriate names.

1. Roman
2. Sans serif
3. Square serif
4. Text
5. Script
6. Novelty

Objective 8

Assignment Sheet 2—Measure Type

Name ____________________ Overall Rating __________

Date ____________________

Evaluation Criteria	Rating
• Directions were followed	______
• Accurately measured line width, type size, and leading and line depth	______

Basic Skills

Reading Mathematics

Materials list

- Line gauge
- Pencil

Directions

Using a line gauge, measure the type copy shown below and write the appropriate answer for each.

Line Length

Measuring and fitting type are not difficult
processes, but they do require knowledge

1. ________ picas wide

Measuring and fitting type are not difficult processes,
but they do require knowledge of definitions of terms

2. ________ picas wide

Measuring and fitting type are not difficult processes, but
they do require knowledge of the meanings of various terms

3. ________ picas wide

BEST COPY AVAILABLE

Type Size

Calculations. As a result, your prediction of

4. ________ points

The Typewritten Copy

5. ________ points

Typewritten Copy

6. ________ points

Leading and Line Depth

Measuring and fitting type are not difficult processes, but they require knowledge of the meaning of such terms as point, pica, measure, leading, and justify, and some mathematical information

7. ________ point body type size
8. ________ point line depth
9. ________ point leading

Objective 9

Assignment Sheet 3—Identify Formats of Type Composition

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Located and correctly labeled examples of each of the eight formats of type composition	______

Basic Skills

Reading

Critical Thinking

Materials list

- Magazines
- Newspapers
- Books
- White paper
- Scissors
- Pencil
- Glue

Directions

Collect samples of different formats of type composition. They may be cut out of magazines or newspapers or photocopied from books. Paste these on plain white paper and label as to format. Find at least one of each of the following:

1. Centered
2. Flush left
3. Flush right
4. Justified
5. Runaround
6. Molded
7. Tabular
8. Ruled form

Unit Contents

Student Components

Student Page

Objective Sheet 8–3

Information Sheet 8–5

Assignment Sheets

  1—Calculate Copyfitting 8–13
  2—Mark Up Copy 8–15

Job Sheets

  1—Set Type Using a Phototypesetting Machine 8–17
  2—Set Type Using a Computer 8–19

Objective Sheet

Unit Objective

After completing this unit, the student should be able to distinguish between various composition methods, calculate copyfitting, mark up copy, and set type. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 85 percent on the written test.

Note: Electronic prepress and desktop publishing have replaced traditional typesetting in many printing plants.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to typesetting with their definitions.
2. List composition methods.
3. Match composition methods with their advantages or disadvantages.
4. Select true statements concerning the typesetting process.
5. Select true statements concerning copyfitting.
6. Select true statements concerning marking up copy.
7. Calculate copyfitting. (Assignment Sheet 1)
8. Mark up copy. (Assignment Sheet 2)
9. Set type using a phototypesetting machine. (Job Sheet 1)
10. Set type using a computer. (Job Sheet 2)

Information Sheet

Objective 1

Terms and definitions

a. **Character count**—Number of characters in a pica, inch, or line; it is different for each typeface and size and varies with extending or condensing

b. **Cold type**—Type produced by means other than hot metal

c. **Compose** (typeset)—To set type by any method

d. **Composition**—Type that has been set

e. **Compositor** (typesetter)—The individual who sets type

f. **Copy** (manuscript)—Any written material needing to be typeset

g. **Copyfit**—To calculate how much space a given amount of copy will occupy when set in a specified size and typeface

h. **Cursor**—Indicator that locates on the monitor where the next action will take place

i. **Digital type**—Characters, such as from a laser printer or phototypesetter, made up of thousands of lines or dots positioned by a computer

j. **Floppy disk**—A small, flexible plastic disk used to store data magnetically

k. **Format**—Specifications that the typesetter translates into computer-specific codes to perform rapid setup of type size, style, line width, leading, indents, or a combination of these functions

l. **Hard copy**—Copy on paper as opposed to the "soft" copy in electronic memory

m. **Hot type**—Type composed by machine from molten metal; sometimes includes hand-set type

n. **H&J**—Hyphenation and justification

o. **In-house composition**—Typesetting done in the offices of organizations requiring printed materials

p. **Keyboard**—Primary computer input device including character keys, numeric keys, direction keys, and other special keys for typographic commands

q. **Laser**—Acronym for Light Amplification by Stimulated Emission of Radiation

r. **Laser printing**—A type of electrostatic printing in which the image is created by modulating a laser on and off according to digital information from a computer

s. **Mark up**—To indicate on layout or copy instructions for typesetting

t. **Modem**—Device to connect one computer to another via telephone lines

u. **Monitor** (sometimes known as a CRT because it uses a cathode ray tube)—A cathode-ray tube keyboard-operated device for displaying copy, making corrections, combining copy elements, and performing other typesetting functions

v. **Mouse**—Small device used to move the cursor on a computer screen

w. **OCR** (optical character recognition)—A scanner that reads typed manuscripts and produces a magnetic or perforated tape or electronic signals from which type can be set

x. **Pagination**—Electronic generation of text and graphics that allows layout and design of multiple pages of a publication to be done on a monitor

y. **Specifications**—Instructions about the typefaces, size, style, leading, measure, arrangement, etc.

z. **Type house**—A business that sets type

aa **Type specimen book**—Book showing examples of all typefaces available from a type shop

bb. **WYSIWYG**—Abbreviation for "What You See Is What You Get"

Objective 2

Composition methods

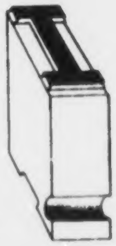
a. **Hot type**—Traditional method of composition; can be printed directly onto surface of paper

Note: Hot type refers to cast metal type whether set by hand or machine.

- Hand-set or foundry composition

  Note: Individual metal or wood characters are assembled into lines similar to those Gutenberg invented about 1450.

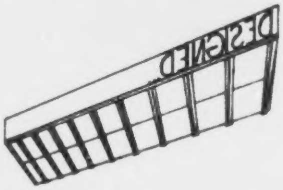
  Figure 1—Hand-set character



- Machine-set (Can be produced on any of four machines: Linotype, Intertype, Monotype, Ludlow type)

Note: When introduced about 100 years ago, line-casting machines revolutionized the printing industry.

Figure 2—Linotype/Intertype Slug



b. **Cold type**—Main method of composition today; any copy that can be photographed

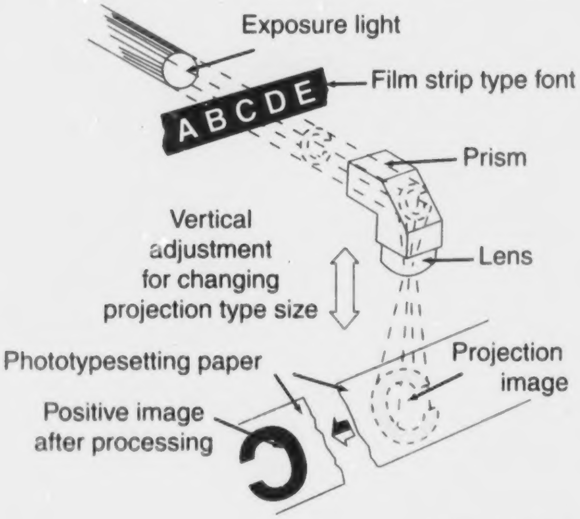
- Hand lettering
- Transfer type and press-on lettering
- Strike-on composition

Note: Several machines can be used, including typewriters and computer daisywheel or dot matrix printers.

- Photographic typesetting

Note: Phototypesetting is a photographic process; letter images are recorded on light sensitive paper or film that is then developed and printed. Depending on the machine, each letter is set by hand (photolettering) or set automatically using a keyboard (photocomposition). Computers drive photocomposition systems today.

Figure 3—Projection principle of photographic typesetter

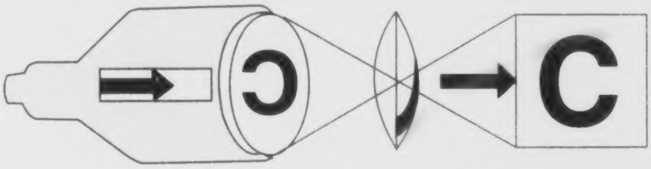

Exposure light
Film strip type font
A B C D E
Prism
Vertical adjustment for changing projection type size
Lens
Phototypesetting paper
Projection image
Positive image after processing
C

BEST COPY AVAILABLE

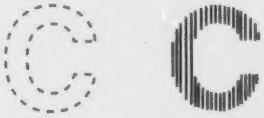
- Digitized typesetting

  Note: A computer-driven, digital typesetter stores type fonts and symbols as digitized information, i.e. magnetic signals generating letters made up of thousands of tiny, overlapping lines, with output etched by a high-resolution laser that creates type. Machines can create type on photographic paper or plain paper.

  Figure 4—Principle of the digital typesetter

  The scanner "reads" the character and stores it as an outline.

  The outline is then filled in with tiny lines.

- Computer composition

  Note: The introduction of "desktop publishing" in 1984 put the power of professional-quality typesetting and page production in the hands of personal computer users. The copy you are reading was set on a personal computer and sent electronically to an imagesetter.

Objective 3

Advantages and disadvantages of composition methods

Note: Factors to consider when selecting a composition method are quality, speed, and cost.

a. Hand-set or foundry composition—Slow and time-consuming; no longer widely used

b. Machine set—By today's standards, slow; offers limited choices of typestyles and sizes, but still used for short letterpress jobs by a few printers and for premium typesetting jobs by a few type shops

c. Hand lettering—Used primarily in custom design work

d. Transfer type—Slow but popular method of preparing small amounts of distinctive display type; offers the greatest range of typefaces for the least money

   Note: In addition to letters and numbers, sheets with borders, rules, symbols, ornaments, drawings, screens, etc. are also available.

e. Strike-on composition—Low cost and adequate quality, but limited to text sizes only in small range of typestyles

f. Photographic typesetting—Major advantages of photocomposition are excellent image quality, wide choice of typestyles and sizes, speed, versatility, and low cost.

Note: Photolettering is ideal for producing quality headlines for low-budget, fast turnaround jobs

g. Digitized typesetting—Offers tremendous advantages, including high speed, excellent image quality, wide choice of typestyles and sizes, and ability to output both type and graphic information

h. Computer composition—Coupled with laser printers, puts typesetting into the hands of writers and editors

Note: Computers output to low resolution plain paper laser printers and high resolution photographic imagesetters.

Objective 4

The typesetting process

a. Where typesetting is done

- Independent "type houses"
- Printers
- Quick-copy shops
- Publishers of newspapers, magazines, and books
- In-house (organizations with own typesetting facilities)

b. How copy is delivered to typesetter

- As handwritten material
- As typed manuscript
- By electronic options such as interfacing via floppy disk or modem

  Note: For anyone planning a career in any activity connected with typesetting, a basic knowledge of working with computer terminals and systems is essential.

c. Factors affecting cost of typesetting

- Condition of copy
- Amount of keyboarding required
- Complexity of copy
- Deadline
- Number of changes and corrections

d. Factors affecting quality

- Type should meet quality standards appropriate to the job.
- Fuzzy type can come from strike-on printers using cloth instead of carbon ribbons, dot matrix printers that are out of alignment, and photo units that are out of focus.
- Broken characters can come from poor quality transfer and press-on lettering, scratched font negatives and digital disks with flawed sectors.
- Lines of type may not be parallel to each other if paper goes through the processor's feeder mechanism with uneven tension.
- Type of paper influences the reproduction quality of type.

Objective 5

Copyfitting

a. Calculating total typewriter characters in job to be typeset

- Typewriter character count method
  - Elite typewriter type has 12 characters per inch, so multiply line length by 12, times number of lines.
  - Pica typewriter type has 10 characters per inch, so multiply line length by 10, times number of lines.

    Note: This is not the same as a pica measurement.
  - For a proportional typewriter, look for manufacturer's specifications, or use character count method.
- Vertical line method
  - Draw a vertical line down the typewritten copy at the end of the shortest full line of type.
  - Count the characters in that line, and multiply by the number of lines.

    Note: Count a short line at the end of a paragraph as a full line.
  - Add to the product the number of characters on the right side of the line for total character number.

    Note: Copy submitted to a printer should always be typed.

b. Converting typewritten characters to typesetting

- Determine type size and type characters per pica from the catalogue, i.e., 2.5 characters per pica.
- Determine line measure, i.e., 30 picas wide.

438

- Determine number of typeset characters in each line, i.e., 2.5 characters x 30 picas wide.
- Determine number of lines of typeset copy that will be required to set all of typewritten copy.

c. Depth of copy

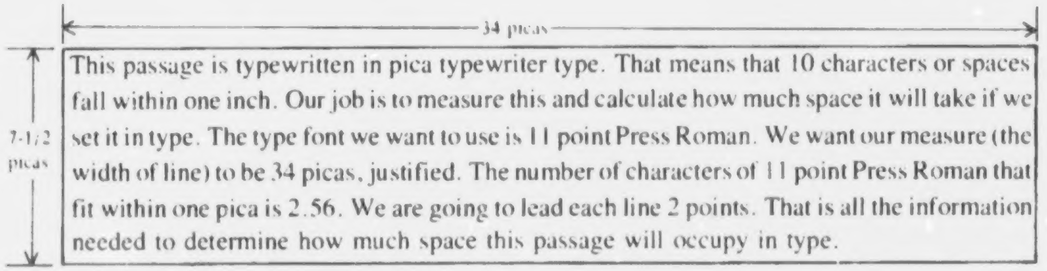
- Determine if copy is to be set solid or leaded.
- Calculate leading plus type point size times number of lines for depth of typeset copy.

Example: Translating copy space to type space

This passage is typewritten in pica typewriter type. That means that 10 characters or spaces fall within one inch. Our job is to measure this and calculate how much space it will take if we set it in type. The type font we want to use is 11 point Press Roman. We want our measure (the width of line) to be 34 picas, justified. The average number of characters of 11 point Press Roman that fit within one pica is 2.56. We are going to lead each line 2 points. That is all the information needed to determine how much space this passage will occupy in type.

Step 1—Measure each line or use vertical rule method and determine number of characters in passage.
Step 2—Divide the total number of characters by 2.56 to determine total number of picas in printed passage.
Step 3—Divide total number of picas by 34 (the number of picas in the line to be printed) to obtain the number of lines in the passage.
Step 4—Multiply number of lines by 13 points (11 points plus 2 points leading) to obtain depth of passage in points; then convert to picas by dividing by 12.

Your calculations will show that there are 544 characters in the passage, that will occupy 212.54 picas in 11 point Press Roman, or a little more than six 34-pica measure lines each 13 points deep, or a total of 91 points or almost exactly 7 1/2 picas deep. So the following block should contain the passage, 34 picas wide and 7 1/2 picas deep.



This passage is typewritten in pica typewriter type. That means that 10 characters or spaces fall within one inch. Our job is to measure this and calculate how much space it will take if we set it in type. The type font we want to use is 11 point Press Roman. We want our measure (the width of line) to be 34 picas, justified. The number of characters of 11 point Press Roman that fit within one pica is 2.56. We are going to lead each line 2 points. That is all the information needed to determine how much space this passage will occupy in type.

Information Sheet

Objective 6

Marking up copy

a. Specify type ("spec" copy).

- Mark instructions in margins, not on copy.
- Use letters or numbers to key layout elements to copy.
- Mark typestyle and size for text and display copy.

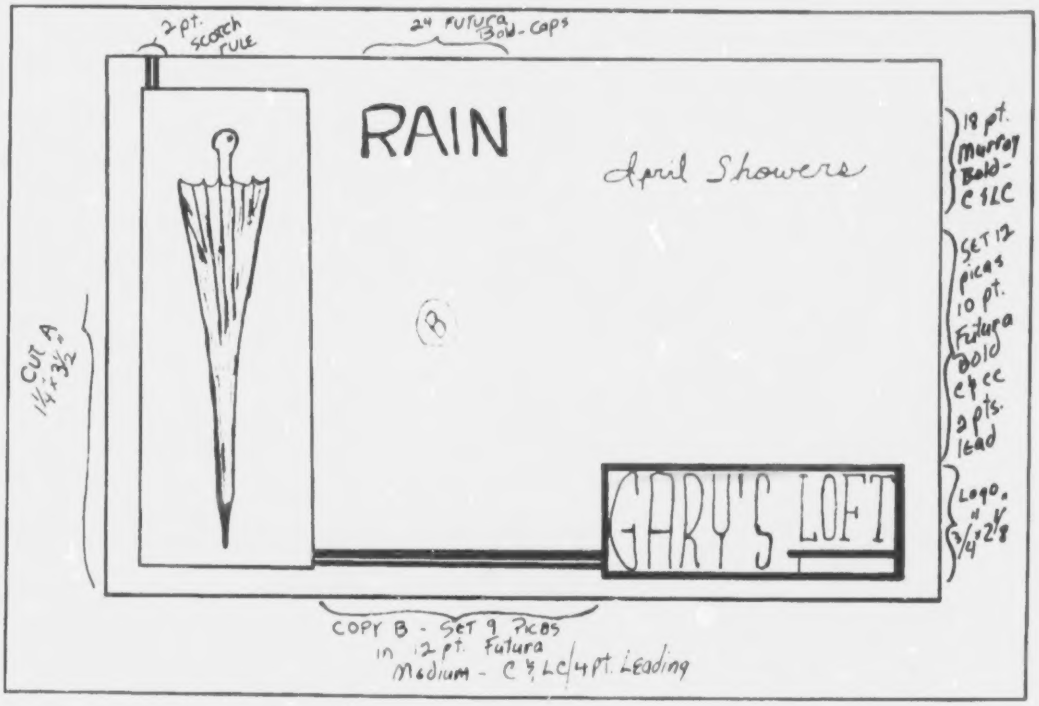
  Note: Trade practice dictates that normal upright posture is assumed unless typesetting specifications state otherwise.

- Mark line measures and leading.
- Mark whether to set flush left, flush right, or centered.
- Specify indentation and paragraph spacing.
- Provide special instructions if necessary; i.e. letterspacing.

b. Read and correct copy with proper proofreading marks.

Note: Proofreading is covered in Unit 11.

Figure 5


2 pt. scotch rule
24 Futura Bold-Caps
RAIN
April Showers
18 pt. Murray Bold- C & LC
Set 12 picas 10 pt. Futura Bold C & LC 2 pts. lead
B
Cut A 1¼ x 3½
GARY'S LOFT
Logo. 3/4" x 2 1/8
COPY B - SET 9 PICAS in 12 pt. Futura Medium - C & LC/4 pt. Leading

Objective 7

Assignment Sheet 1—Calculate Copyfitting

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Accurately determined the space typewritten copy will occupy in each of the three examples	______

Basic Skills

Reading Mathematics

Directions

Calculate in picas the space the typewritten copy on the following page will occupy if it is:

1. Set solid in 12 point Aldine Roman (2.5 characters per pica average) justified on a 24 pica measure.
2. Set solid 9 point Press Roman (2.9 characters per pica average) justified on an 18 pica measure.
3. Set in 12 point on 15 Aldine Roman (2.5 characters per pica average) justified on a 30 pica measure.

Write your answers in the corresponding blanks.

1. ______________________________
2. ______________________________
3. ______________________________

Assignment Sheet 1

Measuring and fitting type are not difficult processes, but they require knowledge of the meaning of such terms as point, pica, measure, leading and justify, and some mathematical ability. Also, you have to keep in mind that, although you are dealing with measurements as small as about 1/72 of an inch, you are still not going to be able always to predict exactly how much space a given piece of copy is going to occupy when it is set in type. The reason for this unpredictability is that, in type, different characters are of different widths, and (since it would take too much time to add up all the different widths of all the different characters) we use an average character width in our calculations. As a result, your prediction of space to be occupied by type in a medium-length paragraph may be a line or so long or short. Still your prediction will be close enough to be able to make a good layout, and, with good editing, it is even possible to make it come out "on the nose."

Objective 8

Assignment Sheet 2—Mark Up Copy

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Marked copy showing text size and style	______
• Marked column width in picas, display type size and style and leading	______
• Mark-up is legible and written in margins only	______

Basic Skills

Reading Mathematics

Directions

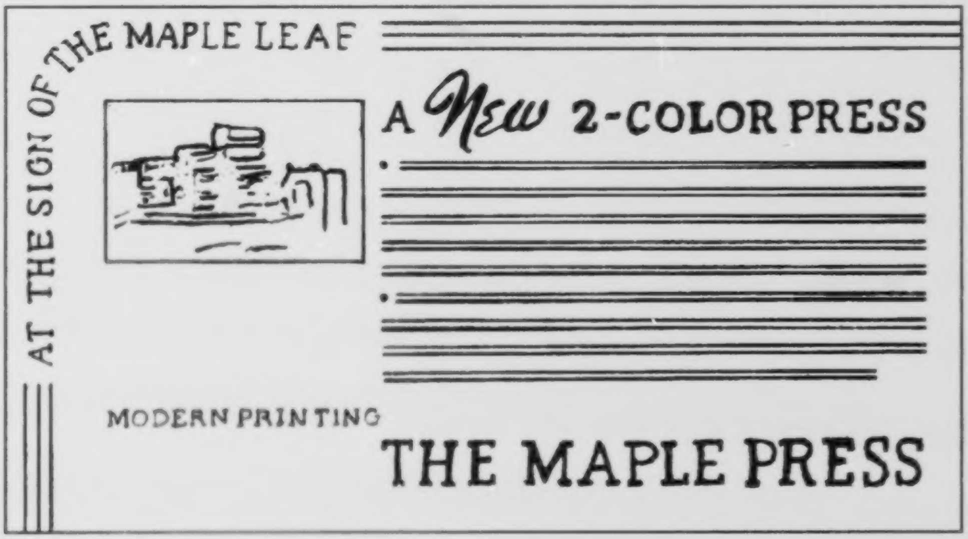
Mark up the layout shown below. Indicate all of the following:

A. Text type size and style

B. Width of columns in picas

C. Display type size and style

D. Leading


AT THE SIGN OF THE MAPLE LEAF
A New 2-COLOR PRESS
MODERN PRINTING
THE MAPLE PRESS

BEST COPY AVAILABLE

Objective 9

Job Sheet 1—Set Type Using a Phototypesetting Machine

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Marked up copy properly	______
• Set phototypesetting machine according to instructions	______
• Typeset copy accurately	______
• Developed copy according to instructions	______
• Corrected copy (if necessary)	______
• Cleaned the work area after completing assignment	______

Basic Skills

Reading Mathematics Critical Thinking Employability Technology

Introduction

Whether using a computer or dedicated phototypesetting machine, those in the printing industry will need to be familiar with keyboarding and typesetting concepts as both of these tools will be the dominant machines used in years to come.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- Phototypesetting machine
- Type image carrier
- Line gauge
- Copy furnished by instructor
- Processor and chemicals

Procedure

☐ 1. Consult instruction manual for machine to be used.

☐ 2. Mark up copy from information given by instructor.

☐ 3. Determine format to copy.

☐ 4. Select typestyle and place font or film strip on machine.

Note: Instructor will demonstrate or aid you in this step.

☐ 5. Set machine for type size, if necessary.

- ☐ 6. Set machine for leading.
- ☐ 7. Determine line length for copy to be set.
- ☐ 8. Change machine line length to appropriate position.
- ☐ 9. Ask instructor to check all settings.
- ☐ 10. Typeset copy, following directions as marked.
- ☐ 11. Prepare chemicals for processor, if necessary.
- ☐ 12. Run out necessary leader, and remove photo paper from typesetting machine.
- ☐ 13. Develop paper in processor.
- ☐ 14. Proofread copy.
- ☐ 15. Make corrections.
- ☐ 16. Turn in for evaluation.
- ☐ 17. Clean up all materials from areas used.

Evaluator's Comments: ____________________________________

____

____

495

Objective 10

Job Sheet 2—Set Type Using a Computer

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Marked up copy properly	______
• Set computer according to instructions	______
• Typeset copy accurately	______
• Printed copy according to instructions	______
• Corrected copy (if necessary)	______
• Cleaned the work area after completing assignment	______

Basic Skills

Reading Mathematics Critical Thinking Employability Technology

Introduction

Whether using a computer or dedicated phototypesetting machine, those in the printing industry will need to be familiar with keyboarding and typesetting concepts as both of these tools will be the dominant machines used in years to come.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- Computer, such as Macintosh or Windows-based computer
- Copy furnished by instructor
- Line gauge
- Plain white or coated paper
- Laser printer

Procedure

☐ 1. Consult instruction manuals for computer and software to be used.

☐ 2. Mark up copy from information given by instructor.

☐ 3. Turn on computer, open software, and set for typestyle and size, format, leading, and line length.

☐ 4. Ask instructor to check all settings.

☐ 5. Typeset copy, following directions as marked.

☐ 6. Turn on printer and load paper, if necessary.

☐ 7. Print.

☐ 8. Proofread copy.

☐ 9. Make corrections.

☐ 10. Turn in for evaluation.

☐ 11. Clean up all materials from areas used.

Evaluator's Comments: ______________________

____

____

497

Unit 9 — Design Principles

Unit Contents

Student Components

	Student Page
Objective Sheet	9–3
Information Sheet	9–5
Assignment Sheets	
1—Make Thumbnail and Rough Layouts	9–29
2—Label Magazine Ads That Utilize Principles of Design	9–31
3—Identify Types of Art in Printed Material	9–33
4—Complete a Drawing of the Printer's Color Wheel	9–35
5—Identify Six Basic Color Combinations in Printed Material	9–37

Objective Sheet

Unit Objective

After completing this unit, the student should be able to apply principles of design in constructing printed communication. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to design principles with their definitions.
2. Match terms related to color with their definitions.
3. Arrange in order the steps in the design process.
4. Select from a list things the designer wants from the printer.
5. List functions of design.
6. List components of printed communication.
7. Distinguish among the three stages of layout.
8. Select true statements concerning principles of design.
9. List basic types of art and their sources.
10. Select true statements concerning working with color.
11. List five kinds of publication design.
12. Make thumbnail and rough layouts. (Assignment Sheet 1)
13. Label magazine ads that utilize principles of design. (Assignment Sheet 2)
14. Identify types of art in printed material. (Assignment Sheet 3)
15. Complete a drawing of the printer's color wheel. (Assignment Sheet 4)
16. Identify six basic color combinations in printed material. (Assignment Sheet 5)

Information Sheet

Objective 1

Terms and definitions

a. **Align**—To arrange elements so they line up with other elements

b. **Alley**—Space between columns on a page

Note: Some page-layout programs use the term gutter when referring to space between columns on a page.

c. **Art**—All pictorial matter: photographs, paintings, drawings, charts and graphs, etc.

d. **Balance**—Proper placement of elements by weight

e. **Bleed**—Any image that extends to the edge of a sheet or page after trimming

f. **Clip art**—High contrast drawings usually on white, slick paper and made to be cut out and pasted into place for the printer

g. **Color swatch**—Sample of an ink color

h. **Comprehensive** (comp)—Layout that looks almost like the final printed piece will look

i. **Continuous tone art**—Photographs, paintings, and other images having a completed range or variation of tones from white to black

j. **Copy**—Everything that will be printed or reproduced: type, photographs, illustrations, etc.

k. **Design**—The plan and arrangement of graphic elements

Note: The person creating a design starts from scratch, making most of the decisions as to medium, size, typography, art, and so on. The person making a layout uses what elements are made available.

l. **Element**—Each individual portion of the printed message

Examples: A heading, photograph, illustration, text, rule, border

m. **Emphasis**—Arrangement of elements that attracts attention to the most important element

n. **Four-color process**—Technique of printing using the four process colors of ink to simulate full color

o. **Gutter**—Space where two pages meet at the binding

p. **High contrast**—Few or no tonal gradations between dark and light areas

q. **Layout**—The preliminary plan or blueprint for any piece to be printed

Note: A layout makes use of what may already be available or what may be dictated by others.

r. **Line art**—Any solid image consisting of black lines on white background without gradation of tones

Note: This includes illustrations to which shading films have been added to give the appearance of gray areas or tints.

s. **Logo**—A trademark or unique type of lettering spelling out the name of a company or product

t. **Margin**—Space that frames the content of a page or sheet

u. **Optical center**—Point slightly above and to the left of the mathematical center

v. **PMS**—Abbreviation for Pantone Matching System, a widely used method of specifying spot color by means of numbered color samples available in swatchbooks

w. **Proportion**—The size relationship of one part of the design to the other parts

x. **Rough**—Simple sketch showing the size and position of the various elements of the design; usually an actual size, somewhat more refined version of the thumbnail

y. **Rule**—Line used for graphic effect

z. **Screen tint**—Area of image printed with dots so ink coverage is less than 100% and simulates shading or a lighter color

aa. **Sequence**—Arrangement of elements to promote eye movement in logical order

bb. **Thumbnail** (miniature)—A small, quickly-drawn sketch that shows a possible way to combine various elements of a proposed printed piece

cc. **Unity**—The overall sense that all elements are related

dd. **White space** (negative space)—Space not occupied by type, art, or other graphic elements

Objective 2

Terms and definitions related to color

a. Primary colors—The three basic colors—red, yellow, and blue—from which all other color can be produced, at least in theory

b. Cool colors—Restful colors like blue and green that tend to recede from the viewer

c. Warm colors—Stimulating colors like red and orange that tend to project toward the viewer

d. Hue—Distinctive characteristics of a given color that enable it to be recognized by name

501

e. Intensity—The full strength or purity of a color

f. Shade—Black added to a color to make it darker

g. Tint—White added to a color to make it lighter

h. Tone—Range of light values from white to black, bright to dull

Objective 3

Steps in the design process

a. Define the problem and audience—Decide what is to be communicated and to whom.

Note: Answer the who, what, where, when, and how questions at this time.

b. Gather information—Research the problem by reading, discussing, and thinking about it.

c. Find solutions—Think of all the bits of information you have gathered and decide the best way to solve the problem.

d. Evaluate solutions—Decide on the best possible solution; then reexamine the solution possibilities.

Note: Decide if it is a cost-effective solution.

e. Refine ideas and present solution—Prepare copy and layout.

Objective 4

Things the designer wants from the printer

a. Fast answers to queries

b. Attention to detail; highest possible quality

c. A fair price

d. On time delivery

Note: The designer is concerned with the visual characteristics of the printed piece and the printer has to translate the designer's vision into what is attainable from typesetting, printing and finishing processes and paper or other printing surfaces.

Objective 5

Functions of design

a. Attract, then hold attention of desired audience

b. Make message easy to read

c. Create a clear, orderly flow of graphic elements

d. Leave some lasting impression

e. Use appropriate technology to deliver the message efficiently and economically

Information Sheet

Objective 6

Components of printed communication

a. Body type (text)

b. Display type (headings)

c. Art

d. Other graphic devices (such as logos, rules, borders, and screen tints)

e. White space

Objective 7

Layout stages

Note: The three stages of layout are classified according to the care in drawing them.

a. Thumbnail

- Small, quick sketch
- Used to explore and develop an idea
- Shows different ways to lay out printed piece
- Also called the miniature

b. Rough

- Actual size
- Aids in visualizing spacing, balance, proportion, and emphasis
- Tests whether the idea from the thumbnail stage works on a larger scale
- Has specifications for printing job written in margin
- Serves as guideline for making comprehensive
  - Artwork and photos are drawn to suggested size, shape, and tone.
  - Heads may be indicated with zigzag lines or lettered in, but typestyles or weights are not approximated.
  - Copy is indicated with carefully drawn parallel lines.

c. Comprehensive

- Actual size
- Looks as much like final printed piece as possible
- Shown to the client who may have difficulty visualizing job in the rough layout stage

Objective 8

Principles of design

Note: These design principles are not listed in order of importance. They are interactive. One principle should support another.

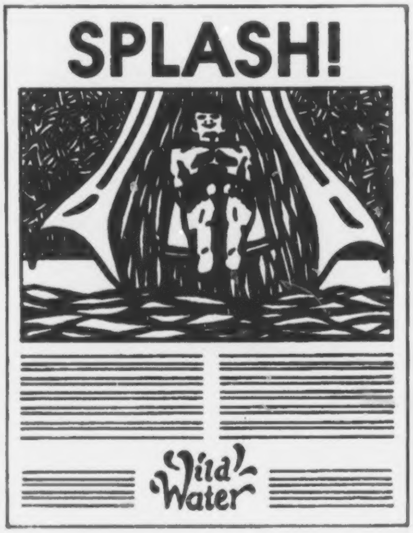
a. Balance

Note: Balance is achieved through control of size, tone, and position of the elements.

- Formal balance
  - Design is symmetrical.
  - Each element that appears on one side of the design also appears on the other side.
  - Usually built around a vertical center line
  - White space is passive.

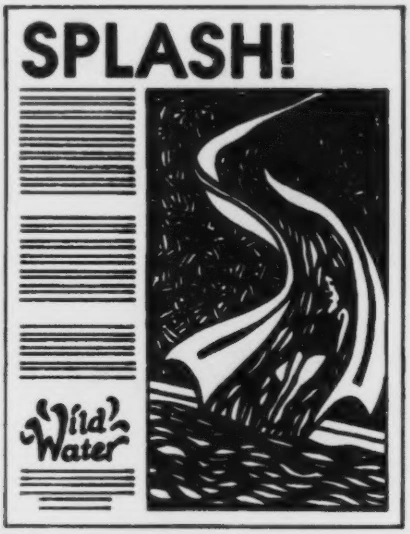
Note: Formal balance is generally used where dignity, formality, and conservatism are required.

Figure 1—Formal balance



- Informal balance
  - — Design is asymmetrical.
  - — Elements are distributed in such a manner that their weights balance each other.

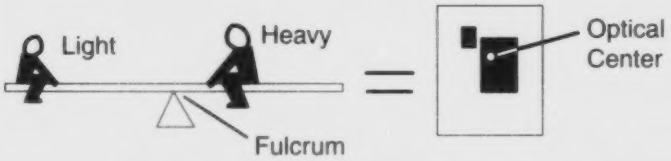
Figure 2—Informal balance



- — The heavier the element in relation to other elements, the nearer it should be placed to the center.

Note: Finding the center of balance among elements is similar to finding the center of balance on a teeter-totter.

Figure 3



- — White space is active.

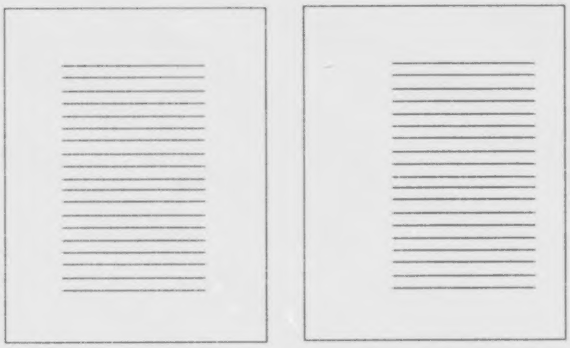
Note: Informal balance is generally used for dramatic effect.

b. Proportion

- Space within a page should be broken up into pleasing proportions.
  - Width of page to depth
  - Width of element to depth
  - Size of one element to another
  - Space between two elements and a third
  - Amount of light area as opposed to dark area, and color to noncolor

  Note: Generally, unequal dimensions make the best design.
- Page sizes
  - Regulation of sheet dimensions will aid in achieving proportion.
  - Page sizes are usually in a 2-to-3 or 3-to-5 width-to-height ratio.
- Margins
  - Single page margins should make type area appear optically centered.
  - Facing pages normally have inside (gutter) margins 1/2 to 3/4 size of outside margins.
  - Equal margins are monotonous, while unequal margins provide interest.

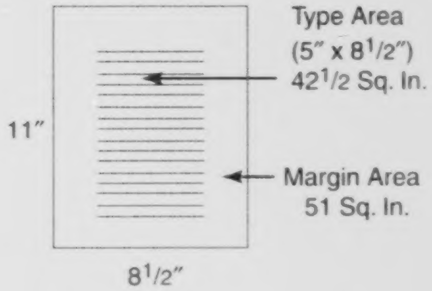
Figure 4



Equal Margins Unequal Margins

- Type in relation to page size
    - — Ideal proportion is type area slightly more or less than area of all four margins.
    - — Variations, for purposes of economy or design, are often made.

Figure 5

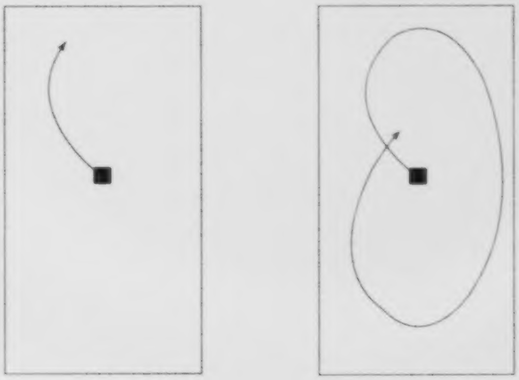


- Shapes
    - — Verticals are the most lively.
    - — Squares should be avoided.

c. Sequence

- Directional pattern
    - — Examination of layout usually begins at optical center.
    - — Exploration of layout continues in a clockwise direction, from center, to upper left, and around.

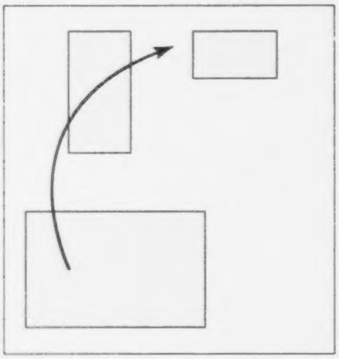
Figure 6



507

- Pointing devices are often used to direct the eye.
- Element positions may suggest eye movement.

  Figure 7

- Rhythm (a sense of purposeful repetition) may be used.
- Natural eye movement is utilized.
  - Big elements to small elements
  - Black to white
  - Color to noncolor
  - Unusual shapes to regular shapes

    Note: The order in which the reader perceives the elements on a page should not be left to chance.

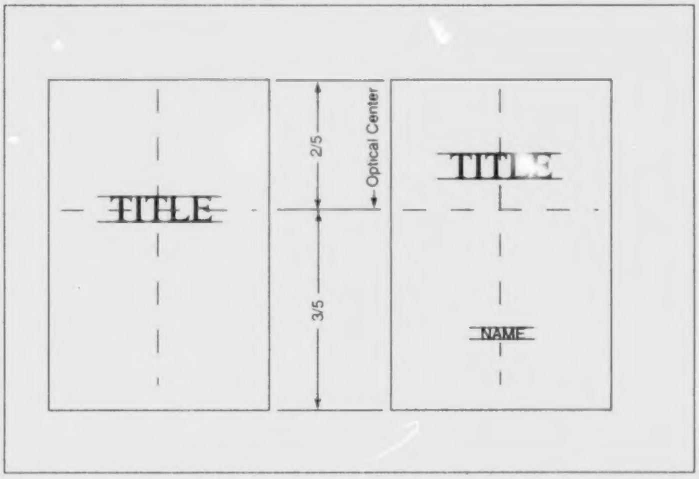
- Horizontal and vertical centers
  - Horizontal
    - The center from side to side
    - Mathematical center, when measured

      Note: If page is to be bound, the type of binding may require consideration in determining the center of the design.
  - Vertical
    - Optical, or apparent center, from top to bottom
    - Not a true mathematical center

      Note: To find the optical center, divide the page vertically into 5 equal parts; the center of balance is not at the mathematical center, but rather 2/5 of the way down the page.

  - Spot the eye hits just when it encounters a printed page
  - Center of balance between two or more elements should follow the page center of balance

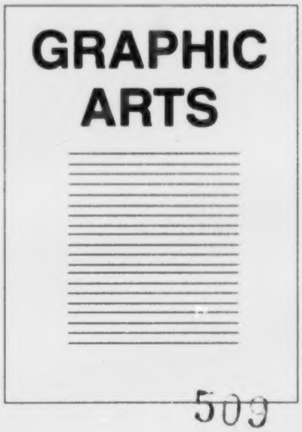
Figure 8



d. Emphasis

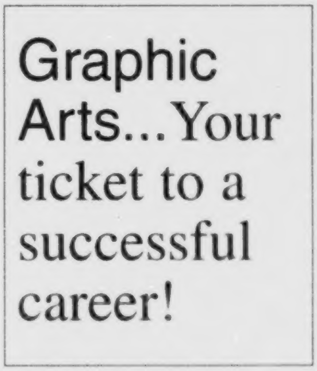
- One element (or a group of elements) should dominate all others.
- Expressed negatively, the principle is contrast.
- Methods used to achieve emphasis.
  - Make one element larger or heavier than other elements on layout.

Figure 9—Larger, heavier type



- Use contrasting typefaces and type variations.

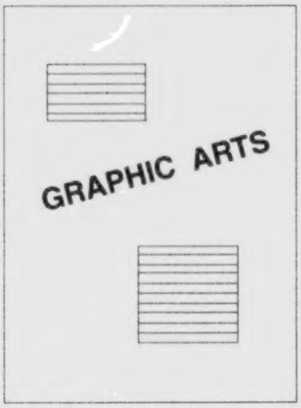
Figure 10—Contrasting type



Graphic Arts...Your ticket to a successful career!

- Single out an element; move it away from clutter of other elements.
- Arrange one element on page to contrast with other elements.

Figure 11—Contrasting arrangement



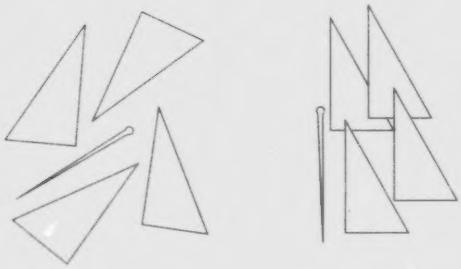
- Give one element a different shape from all others.
- Use different color ink for one element.
- Use a screen tint.
  - For one element
  - For all but one element
- Place borders around one element.

- Use ruled lines.
  - Around one element
  - Pointing toward one element
- Reverse an element (print white letters on a black background).

e. Unity

- A layout has unity when the elements appear to be related and held together, and state a single, unified theme.

Figure 12



a. Disjointed elements

b. Unified elements

Note: The pile of elements on the left have been arranged randomly, but if they are placed as shown on the right, they seem to belong together.

- Methods for achieving unity
  - Run a border around the piece.
  - Squeeze white space to the outside.

    Note: White space affects the quality and readability of material to be printed. More information can often be communicated with less type and careful use of white space.
  - Align two or more elements on a common axis to form a relationship.

- Use elements that harmonize with each other.
  - Type harmony may be achieved when using only one family.
  - Typestyles should be appropriate to shape of page.

    Example: Use condensed type on narrow pages, extended type on wide pages.
  - The typeface should look as if it were designed to fit the style of the art—it must fit the mood of the piece, the overall theme.
- Practice simplicity.
  - Avoid too many different typestyles.
  - Elaborate, fancy typestyles can ruin the effectiveness of a design unless carefully and sparingly used.
  - Art and type should reflect mood of printed piece.
  - More can often make less happen.

Objective 9

Working with art

a. Basic types of art

- Line art
- Continuous tone art

Note: More and more attention is being paid to the role of art in printed communications.

b. Factors that affect art selection

- Availability
- Appropriateness
  - Photographs are more realistic—they can convey believability and credibility.
  - Drawings are more unreal—they are more effective with abstractions.
- Quality
- Mechanical feasibility
- Cost

c. Sources of art

- Continuous tone art
  - Your own photographs
  - Professional photographers
  - Stock photo houses that sell prints for one-time use
  - Photos from government agencies, trade and professional organizations, businesses, chambers of commerce, etc.
- Line art
  - Your own drawings
  - Artists and illustrators
  - Clip art
  - Public domain sources
  - Drawings from government agencies, trade and professional organizations, businesses, chambers of commerce, etc.

Objective 10

Working with color

a. Two basic categories of color printing

- Process color—Method used to reproduce full-color continuous-tone copy, such as color photos and paintings
  - Uses the four process colors: yellow, magenta (process red), cyan (process blue), and black
  - Requires separation, the breaking down of the original copy into the four process colors
  - Requires registration, the accurate positioning of one printing plate over another so that all are in the correct relationship
- Spot (flat) color—Color other than process color; usually printed as solid areas for type, line art, or in lines, bars, boxes, and screened tints
  - Used for the color reproduction of any black and white copy
  - Designated by the number of colors: one-color, two-color (most common), three-color, four-color, etc.
  - Requires a separate printing plate and a separate run of the press for each color, so the more colors used, the more expensive the job

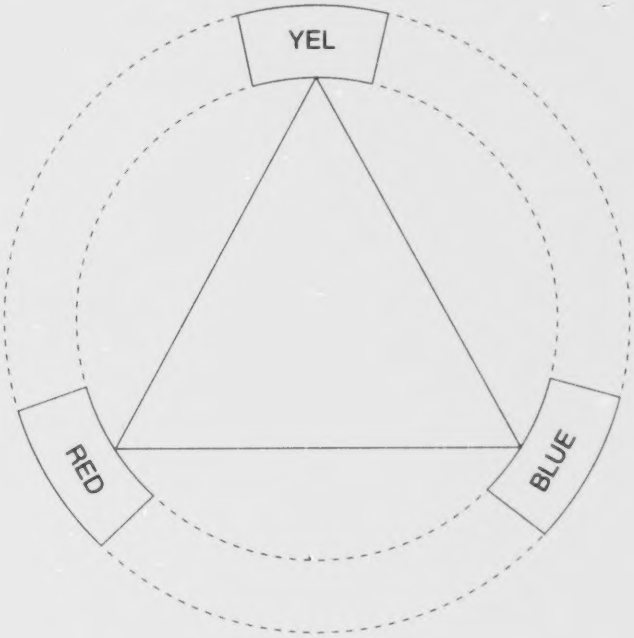
- Pantone Matching System (PMS)
  - An international printing, publishing, and packaging color language providing an accurate method for selection, presentation, specification, communication, matching, and control of color
  - Based on 11 Pantone Colors (9 basic colors, plus black and transparent white) which mixed in varying amounts produce more than 500 different colors
  - Colors are numbered and arranged in a swatchbook

    Note: The designer looks through the swatchbook, chooses the color, and indicates its number.

b. The printer's color wheel

- Primary colors
  - Red, yellow, and blue
  - Foundation of color wheel
  - Place in triangular position as shown

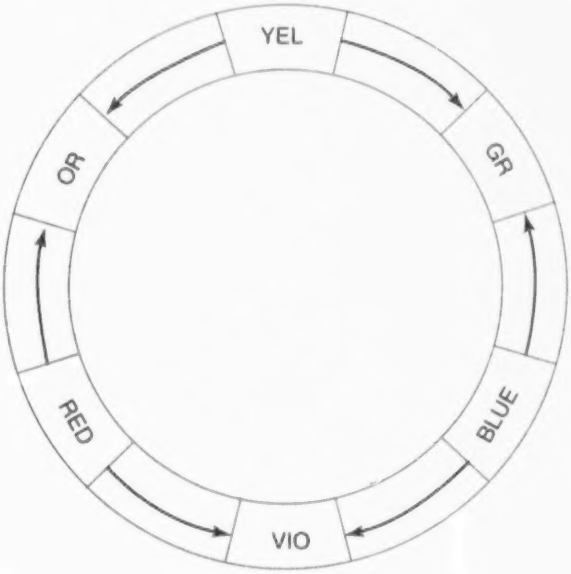
Figure 13



- Subtractive process primary colors—red (magenta), yellow, and blue (cyan)
  - White light interacts with a colorant (such as ink) which subtracts (absorbs or filters out) some of the colors from the white light and allows the unabsorbed colors to be seen by the eye.
  - The subtractive process is used to produce printing in full color.
- Additive process primary colors—red, blue, and green
  - Light rays of certain colors are added to other light rays to produce (add up to) a new color.
  - The additive process is used in process color separation, color photography, color television, and stage lighting.

- Secondary colors
  - Orange, green, and violet
  - Formed by a combination of any two of the primary colors.
  - Orange is made from red and yellow, and should be placed equidistant between them.
  - Green is made from yellow and blue, and should be placed equidistant between them.
  - Violet is made from red and blue, and should be placed equidistant between them.

Figure 14

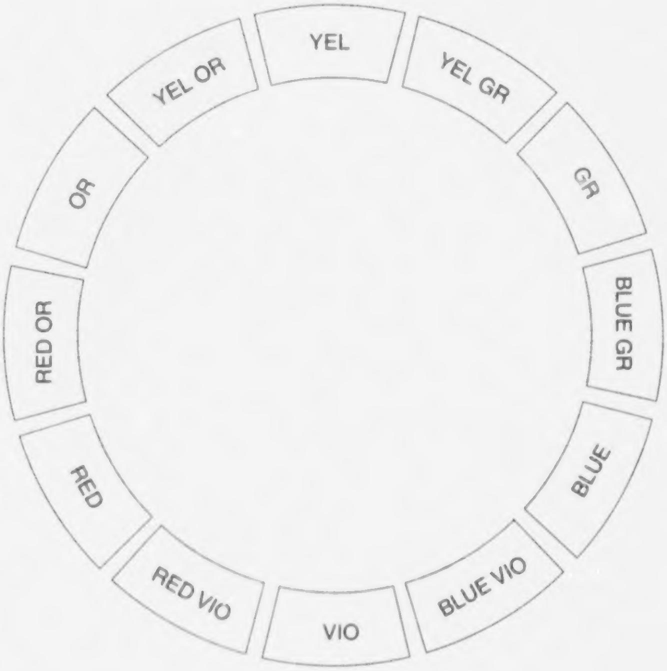


515

- Intermediate colors
  - Colors are red-orange, yellow-orange, yellow-green, blue-green, blue-violet, and red-violet.
  - Formed by combining primary and secondary colors

    Example: Red-orange is made from red and orange, and should be placed between them on the color wheel.

Figure 15



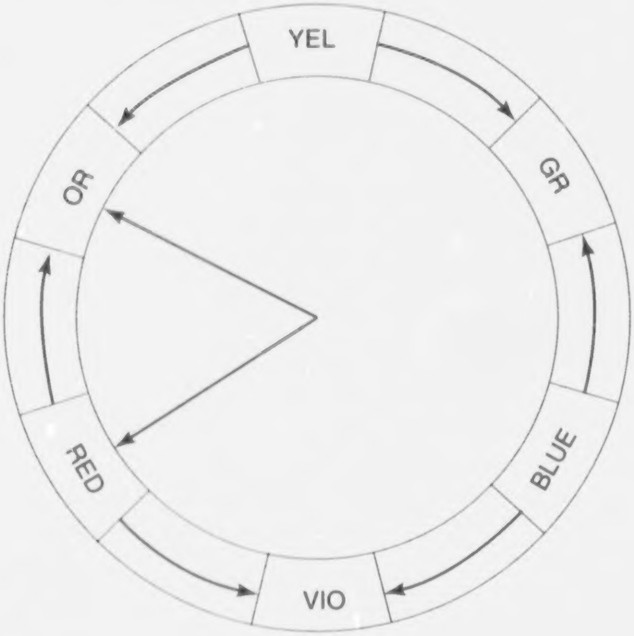
- Tertiary colors
  - Formed by a combination of any two of the secondary colors
  - The tertiary colors are russet (orange and violet), citrine (orange and green), and olive (green and violet).

c. Color combinations

- Monochromatic harmony
  - Utilizes two or more tones of one color
  - Using colored stock with a darker shade ink of the same color will result in harmonious printing.
  - Using white stock, monochromatic harmony may be achieved by using dark colored type with tint blocks, rules, or borders.

- Analogous harmony
  - Combining adjacent (next to each other) colors of the printer's color wheel will create harmony.
  - More than two adjacent secondary colors should not be used, as they will not harmonize.

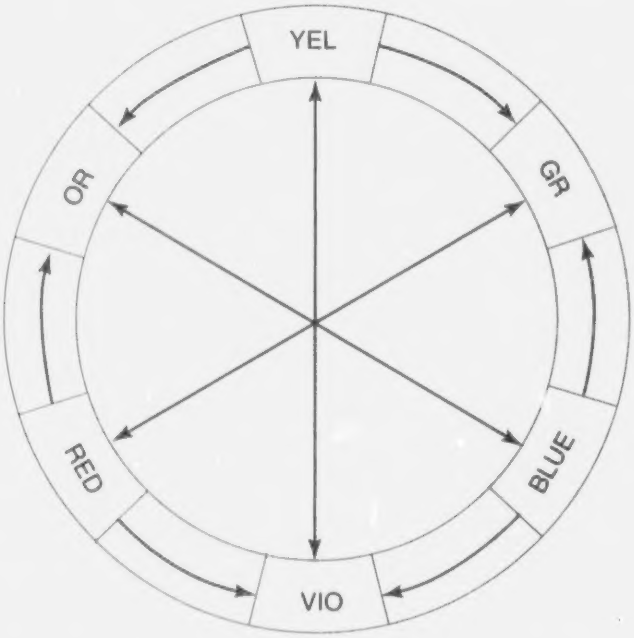
Figure 16



517

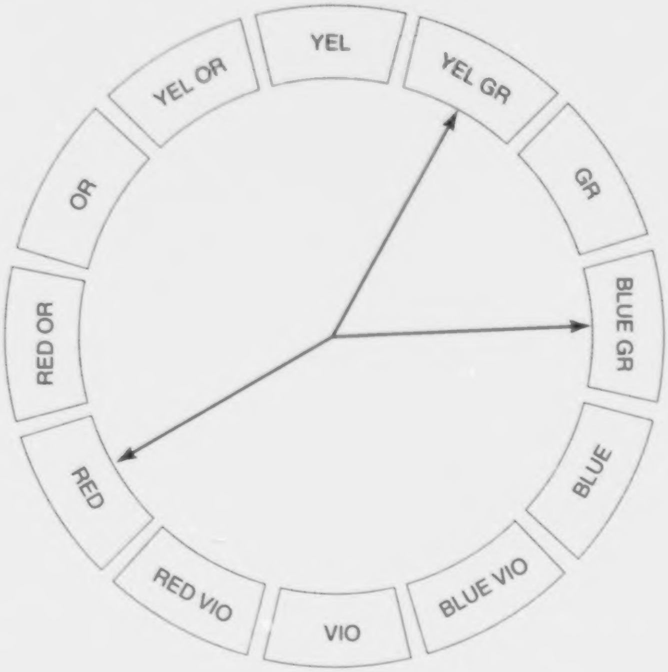
- Complementary harmony
  - Utilizes two colors directly opposite from each other on the color wheel
  - Forms contrasts that attract attention
  - Should not be used together in pure form, rather use one light and one darker color

Figure 17



- Split complements
  - The colors on each side of the complement may be used instead of the complementary color.
  - Use of split complements results in three-color printing.

Figure 18

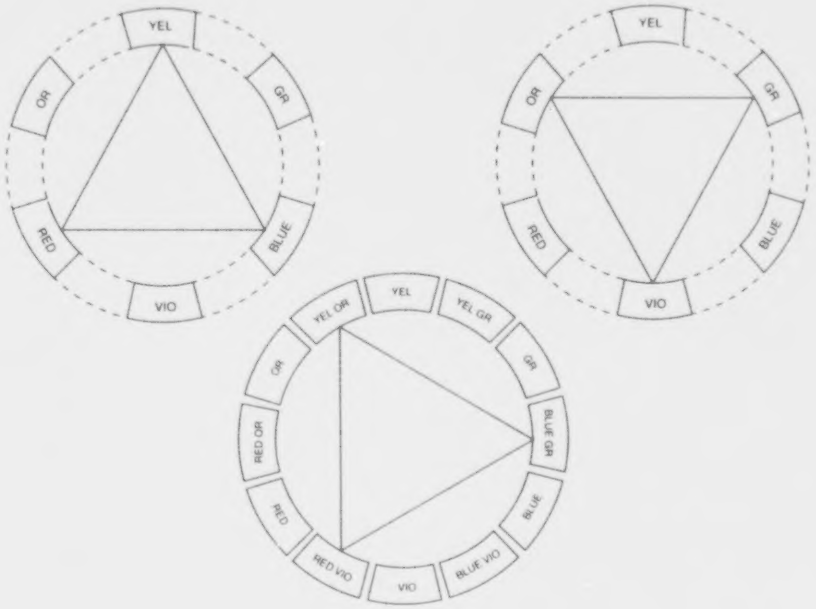


- Triad method
  - The triangle that is formed on the color wheel by the primary colors of red, yellow, and blue may be rotated to any other combination of three colors to create triad harmony.
  - When using triad combinations, they should not all be of the same strength or intensity.

    Note: One should be light, one dark, and the other halfway in between.

- Equal amounts of the colors should not be used, but a large amount of one, and smaller amounts of the other two will give harmonious results.

Figure 19


YEL
GR
BLUE
VIO
RED
OR
YEL
GR
BLUE
VIO
RED
OR
YEL
YEL GR
GR
BLUE GR
BLUE
BLUE VIO
VIO
RED VIO
RED
RED OR
OR
YEL OR

- Black, white, and gray
  - May be used with any color or combination of colors and result in perfect harmony
  - Colors that do not harmonize may be brought into harmony by separating them with bands or edgings of black, white, or gray.

d. Selecting color

- Preferences
  - Men often prefer blue.
  - Red is usually the first choice for women; among younger women purple is a favorite.
  - Teens like pure, brilliant colors and fluorescents.
  - Older persons may prefer soft tones.

- The meaning of color
  - Cool colors, such as blue and green, depict calmness and serenity.
  - Warm colors, such as red, yellow, and their variations, stimulate and show action.
- Special inks and protective coatings
  - Special colors are available; fluorescent ink in many bright colors, and metallic ink in gold, bronze, and silver.
  - Varnishing may be used to enhance and protect photographs during printing.

e. Pointers on using color

- Choose colors as dictated by message content, purpose, and audience.
- One color should dominate.
- When using more than one color, reserve the darkest for the basic message, using the additional color(s) for emphasis or setting a mood.
- When colored inks are used on colored paper, best results will be obtained with a shade of the same color or a complementary color.
- Type in color, or on colored stock, is dangerous; be concerned with readability.
- Type printed in reverse should be within a fairly dark area.
- Use four-color process sparingly; be sure the quality of the art warrants the cost.
- Exercise restraint in the use of additional color; generally a single spot of color is sufficient.
- Develop a library of color use by collecting good examples of pieces that use color effectively.

Objective 11

Kinds of publication design

a. Books

b. Magazines

c. Newspapers

d. Newsletters

e. Miscellaneous publications

Examples: Leaflets, folders, booklets, brochures, catalogs, directories, training manuals, annual reports, calendars, yearbooks, and other pieces produced by advertising agencies, public relations firms or departments, independent art studios or freelancers, and commercial and in-house printers.

Note: Regardless of the type of printed piece, the principles of design are unchanging. However, the designer has a freer hand in designing miscellaneous publications.

Objective 12

Assignment Sheet 1—Make Thumbnail and Rough Layouts

Name __________________________ Overall Rating ________

Date __________________________

Evaluation Criteria	Rating
• Directions were followed	_____
• Submitted an ad containing headline, art, body copy, and logo	_____
• Submitted at least three thumbnail sketches, and one rough layout according to directions	_____

Basic Skills

Reading

Critical Thinking

Materials list

- Pencil
- Tracing paper
- White paper
- Full-page ad or quarter-page ad

Directions

Pick out a full-page ad from a consumer magazine or a quarter-page ad from a newspaper having art, a headline, body copy, and logo.

1. Do a rough layout in reverse. Using a pencil and tracing paper, trace the ad, taking care to suggest the size, shape and tone of the art. Letter in the headline. Indicate body copy by ruling parallel lines. When you have finished, compare the original with your tracing.
2. Rearrange the elements in the ad you selected, not necessarily to improve the ad, but to see what other arrangements are possible. Do at least three thumbnails on 8 1/2" x 11" white paper to explore alternative combinations. Be sure your thumbnails are kept in correct proportion.
3. Choose the thumbnail you like best, and do a rough layout of it.
4. Turn in the original ad, your tracing of it, your thumbnails and new rough.

Objective 13

Assignment Sheet 2—Label Magazine Ads That Utilize Principles of Design

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Submitted ad or ads labeled for proportion, balance, sequence, emphasis, and unity	______

Basic Skills

Reading   Critical Thinking

Materials list

- Magazines
- Tape or glue
- Paper
- Pen or pencil

Directions

Go through magazines and locate ads that utilize the principles of design studied in this unit. Cut these ads out, paste them on separate sheets of paper and label each ad as to what design principle is shown. Find at least one ad utilizing each of the following design principles.

1. Balance
2. Proportion
3. Sequence
4. Emphasis
5. Unity

Objective 14

Assignment Sheet 3—Identify Types of Art in Printed Material

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Submitted at least three examples of line art and three examples of continuous art	______

Basic Skills

Reading

Critical Thinking

Materials list

- Ads from magazines, newspapers, and/or newsletters

Directions

From magazines, newspapers, and/or newsletters, locate examples of the two basic types of art listed below. Bring to class three examples of each and be prepared to tell why you chose them.

1. Line art
2. Continuous tone art

Objective 15

Assignment Sheet 4—Complete a Drawing of the Printer's Color Wheel

Name ______________________________ Overall Rating __________

Date ______________________________

Evaluation Criteria	Rating
• Directions were followed	_____
• Correctly completed color wheel	_____

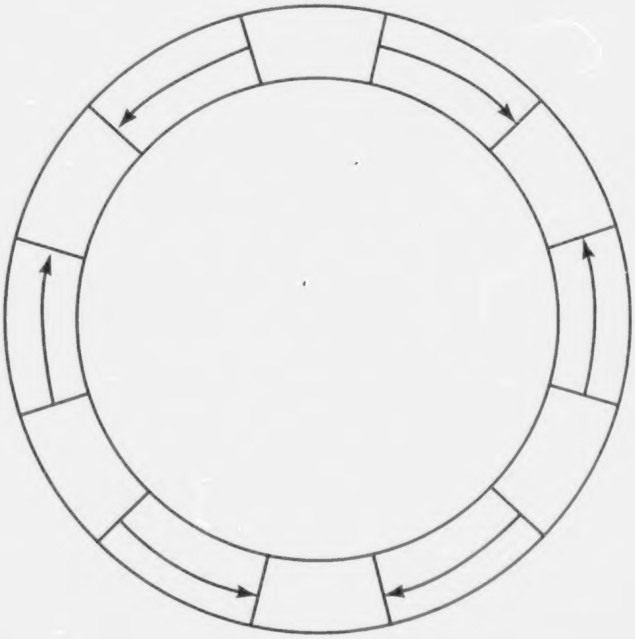
Basic Skills

Reading

Directions

Complete the printer's color wheel below by writing the color names in the appropriate positions.

1. Red
2. Green
3. Violet
4. Orange
5. Yellow
6. Blue



Objective 16

Assignment Sheet 5—Identify Six Basic Color Combinations in Printed Material

Name ______________________ Overall Rating __________

Date ______________________

Evaluation Criteria	Rating
• Directions were followed	______
• Submitted at least one example of each of the basic listed color combinations	______

Basic Skills

Reading

Critical Thinking

Materials list

- Magazines, newspapers, and miscellaneous publications

Directions

From magazines, newspapers, and miscellaneous publications, find and identify examples of the six basic color combinations listed below.

1. Monochromatic
2. Analogous
3. Complementary
4. Split complements
5. Triad
6. Black, white, and gray

Unit Contents

Student Components

Student Page

Objective Sheet 10–3

Information Sheet 10–5

Job Sheets

- 1—Prepare a Paste-Up 10–25
- 2—Prepare Overlays Using Clear Acetate and Ruby Film 10–27
- 3—Crop a Photograph 10–31
- 4—Scale Copy 10–33

Objective Sheet

Unit Objective

After completing this unit, the student should be able to prepare paste-ups, and crop and scale art. The student should demonstrate these competencies by completing the job sheets and by scoring a minimum of 85 percent on the written test.

Note: In an increasing number of print shops, paste-up procedures are being replaced by page-layout software. Still, it is important to be familiar with how paste-up work is done by hand.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to paste-up principles and procedures with their definitions.
2. Identify paste-up tools and materials.
3. Select true statements concerning basic paste-up steps.
4. Match registration methods with their descriptions.
5. Select true statements concerning use of clear acetate and ruby film.
6. Complete statements related to processing art for production.
7. Match kinds of imposition with their descriptions.
8. Select true statements concerning postal regulations.
9. Prepare a paste-up. (Job Sheet 1)
10. Prepare overlays using clear acetate and ruby film. (Job Sheet 2)
11. Crop a photograph. (Job Sheet 3)
12. Scale copy. (Job Sheet 4)

Information Sheet

Objective 1

Terms and definitions

a. **Acetate**—Thin, flexible sheet of transparent plastic used to make overlays

b. **Adhesive**—Wax, rubber cement, glue stick, spray mount or double-faced tape used to hold copy to base sheet

c. **Base sheet**—Surface on which copy is pasted up; usually smooth white hot press illustration board or preprinted grid sheet with all critical guidelines in place

d. **Bleed**—Printed image filling one or more margins and running off the edge of a sheet or page

e. **Camera-ready copy**—Copy which is ready to be photographed for platemaking according to the technical requirements of either quick or commercial printing

Note: The camera part of camera-ready copy refers to process cameras.

f. **Continuous tone copy**—Any image that has a complete range of tones from black to white: photographs, paintings, drawings, etc.

g. **Copy**—Everything that will be printed: type, art, or other graphic elements

h. **Cover sheet**—Second overlay or flap of heavy kraft or cover paper sometimes attached to paste-up for added protection and better appearance

i. **Crop**—To mark a photograph or drawing to indicate which portions are to be reproduced

j. **Dropout**—A term indicating that certain areas of a photograph or screen tint are to be left blank or unprinted

k. **Dummy** (mockup)—A detailed diagram instructing paste-up person how to arrange elements of a printing job

l. **Flop**—To reproduce a photograph or drawing so that it faces the opposite way

m. **Folding dummy**—A set of folded sheets showing the placement of pages and elements within a printed piece; it may be either rough or comprehensive, depending on the client's needs

n. **Ganging**—To make several halftones at the same enlargement or reduction at one time; also, to group together two or more jobs on a single press run

o. **Gripper edge** (leading edge)—Edge of a sheet of paper that enters a sheet-fed press first

Note: Allowance for gripper bite must be made by the designer, paste-up person, and stripper.

p. **Imposition**—Arrangement of pages so that when printed, the press sheet can be folded and bound with the pages in proper sequence

q. **Keyline art**—Art which is prepared for multiple color printing in which the colors overlap slightly

r. **Line copy**—Any image that is solid black with no gradation of tones: clip art, type, rules, dots, etc.

s. **Overlay**—A sheet of acetate placed over a paste-up to hold copy that will appear in another color; also a tissue or tracing paper flap to protect paste-up from dirt and damage and indicate instructions to the printer

t. **Paste-up** (mechanical)—Camera-ready assembly of type, art, and other graphic elements pasted on base sheet in exact position and containing instructions, either in the margins or on an overlay, for the printer; also, as verb, to adhere copy to grids or base sheets

u. **PMT**—Abbreviation for photomechanical transfer, a Kodak trade name for a process used to make same size, enlarged or reduced positive paper, reverse or acetate prints of line and continuous tone copy

v. **Process camera**—Large, sturdily built graphic arts camera used to photograph paste-ups and other copy, while at the same time reducing or enlarging the images as needed

w. **Proportional scale**—A circular slide rule used to calculate percent that an original image must be reduced or enlarged to yield a specific reproduction size

x. **Reverse**—To reproduce the whites in an original as black and the blacks as white

y. **Ruby film**—A two-ply, peel-apart film masking material; usually ruby-red film adhered to a clear film base

Note: Rubylith is the Ulano trade name for one widely-used ruby film.

z. **Scaling**—Process of calculating the percentage by which images should be enlarged or reduced

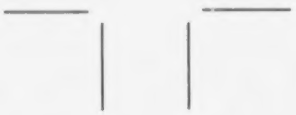
aa. **Signature**—A printed sheet containing a number of pages, usually 4, 8, 16, 32, or 64, that is folded and bound to become part of a publication

bb. **Surprint**—A dark image printed over a lighter image area

cc. **Trailing edge**—Edge of the press sheet that is printed last dd. **Trim marks**—Right angle marks on paste-up to show the four corners of the printed piece after it has been printed and trimmed

Note: Trim marks are also called *tick marks* or *corner marks.*

Figure 1



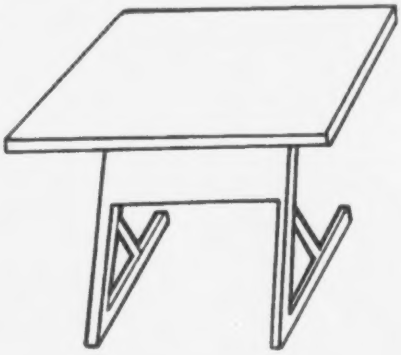
ee. **Window**—Block of masking material on a paste-up that shows position of a photograph or other visual element; a transparent opening in line negatives into which a halftone is stripped

Objective 2

Paste-up tools and materials

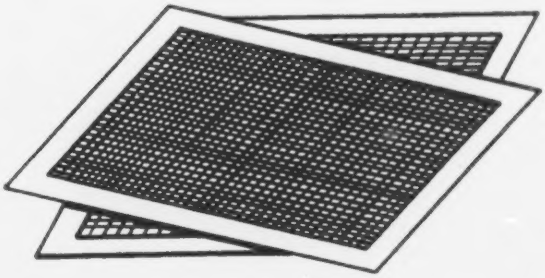
a. Drawing table (or light table)

Figure 2



b. Grid or base sheets

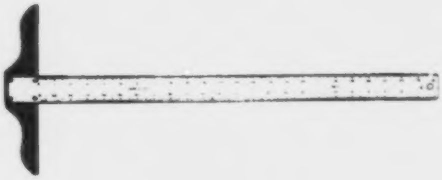
Figure 3



532

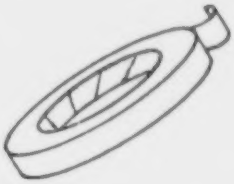
c. T-square

Figure 4



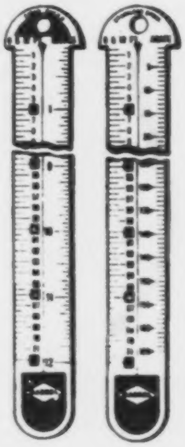
d. Masking or drawing tape

Figure 5



e. Line gauge (or pica pole)

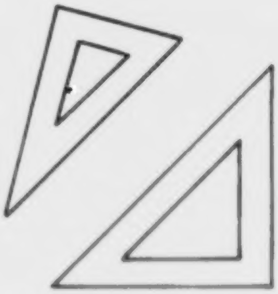
Figure 6



533

f. Triangles

Figure 7

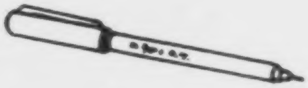


g. Nonreproducing light blue pencil

Figure 8

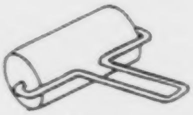
h. Fine-tipped black pen

Figure 9



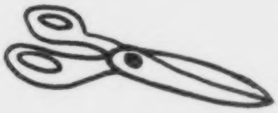
i. Burnishing roller

Figure 10



j. Scissors

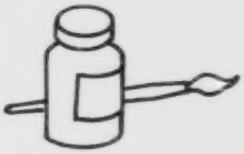
Figure 11



534

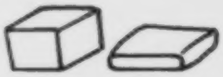
k. Opaque white paint or correction fluid

Figure 12



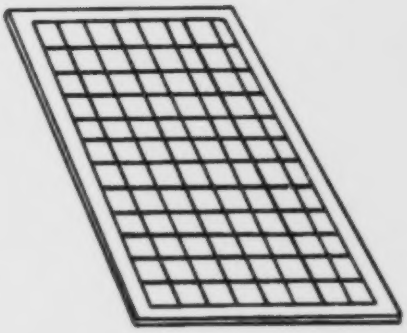
l. Erasers

Figure 13



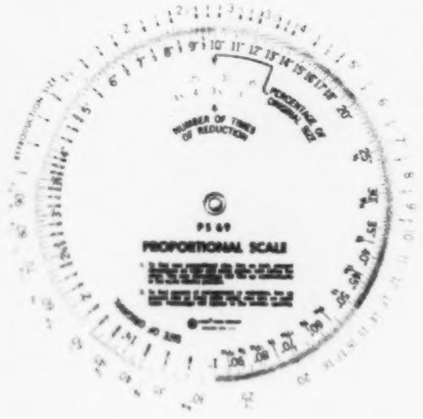
m. Trimboard

Figure 14



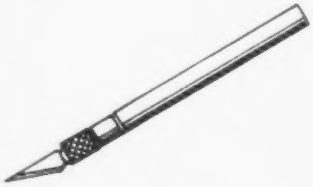
n. Proportional scale

Figure 15


PROPORTIONAL SCALE
NUMBER OF TIMES OF REDUCTION
PERCENTAGE OF ORIGINAL SIZE

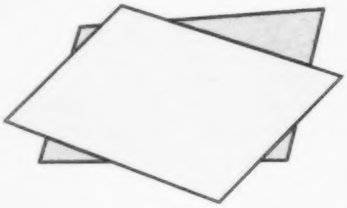
o. X-Acto knife

Figure 16



p. Mechanical films

Figure 17

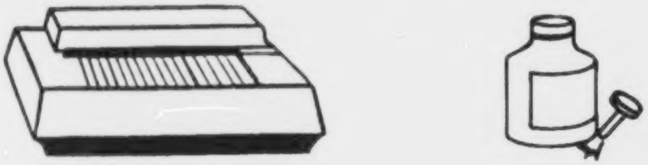


BEST COPY AVAILABLE

q. Waxer, rubber cement, or other adhesives

Note: Waxing is the cleanest, fastest, and most convenient method and allows elements to be moved easily from one position to another, while rubber cement, the old standard, provides better bonding with the main disadvantage being general messiness.

Figure 18



Objective 3

Basic paste-up steps

a. Establish a plan: draw a full-size layout or dummy.

b. Organize all tools and materials

Note: Always maintain clean and safe work habits.

c. Place base sheet square on table.

Note: For basic-quality pieces and periodicals where precision is not required, paste-ups are usually done on preruled paper sheets tailored to the publication's format; premium-quality pieces, such as those produced by advertising agencies, are usually done on heavy and expensive illustration board.

d. If not using a preruled sheet, draw light blue (nonreproducible) guidelines on base sheet.

e. Using fine-tipped black pen, draw trim marks and dotted folding lines on base sheet.

f. Trim excess paper from elements.

Note: Some people prefer to trim and wax everything before beginning paste-up. It is better to wax small pieces of type and art before trimming so they won't be lost in the waxer. If using rubber cement or other adhesive, apply it as you go.

g. Position and paste down line copy on base sheet.

Note: Work from top of layout downward, pasting and squaring all elements. Keep checking for proper positioning and straightness to catch any flaws as quickly as possible.

h. Position and paste down continuous-tone copy.

Note: If halftones are made as film negatives, they need only be indicated for size and position; indicate by drawing a red holding line, using ruby film, or pasting down opaque red or black blockout film; key all photos; if halftone paper prints are used, handle like line copy.

i. Apply rules, borders, and other finishing touches.

- Methods of ruling
  - — Typesetting machines
  - — Pen and ink
    - – Ruling pen lines on one sheet combined with type on another
    - – Variable line widths from hairline to 3 point
  - — Scribing lines
    - – Scribed or scratched through emulsion on film negative
    - – Scribing tools and line-up table recommended for accuracy
  - — Adhesive border tape
    - – Self-adhering tape in roll form
    - – Many different sizes and styles
- Making mitered corners
  - — Position tape on the paste-up with tape overlapped beyond the corner of box.
  - — Use a straight edge and sharp X-Acto knife to cut carefully at a 45-degree angle.
  - — Remove excess tape and burnish border into position.

j. Check paste-up against layout or dummy.

k. Lay protective sheet over page and burnish entire surface with roller.

l. Cover finished paste-up with tissue or tracing paper overlay and, if desired, protective cover sheet.

m. Recheck the paste-up, make sure it is clean and neat, and write instructions to printer; to get an idea of how the printed piece will appear, make a photocopy of the paste-up.

Note: Rapid changes in graphic arts production have reduced the need for paste-up work by hand. Computers now make it possible to create and produce printed pieces right at your own desk. You can rearrange elements until you get your layout exactly the way you want it. What you see on your computer screen is what you will get on the printed page.

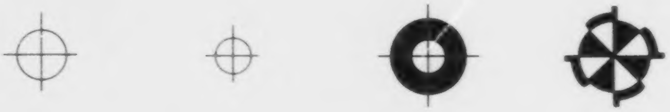
Objective 4

Registration marks

a. Register marks

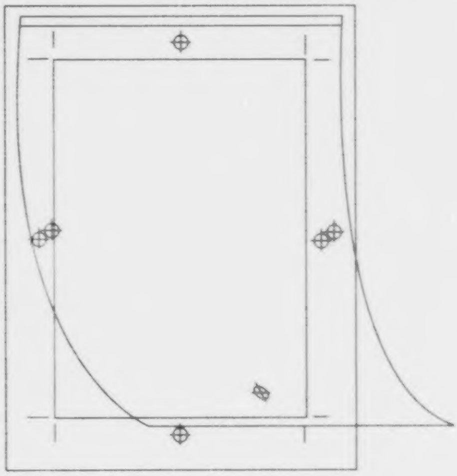
- Small designs placed on artwork to control the accurate placement of one color over another

Figure 19



- Duplicate designs are placed on overlays in alignment with copy or illustration boards.

Figure 20—Paste-up with an overlay sheet



533

b. Register pin system

- Common, accurate method of registering multiple exposures
- Pins are placed on illustration board and each overlay has prepunched holes which are placed on pins to align images.
- Pin system is often carried through camera, stripping, and platemaking operations for accurate registration.

  Note: Paste-ups with numerous overlays must usually be taken apart to photograph, which makes the pin register system much quicker to use and also more accurate.

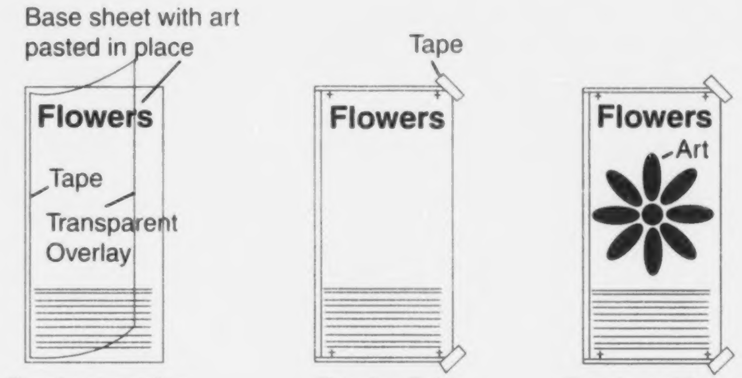
Objective 5

Use of clear acetate and ruby film

a. Preparing color overlays

- Paste the black (or major color) copy to the base sheet.
- Paste each additional color in precise position on an acetate overlay, one representing each color.
- Securely attach each overlay to the top of the base sheet with masking tape.
- Use registration marks to ensure that all elements are kept in alignment.
- Add color swatch showing the desired color to each overlay along with printing instructions.

Figure 21



Overlay taped to edge of base sheet.

Overlay flat to base sheet.

Overlay with art pasted in place.

Note: Where colors do not overlap, the color separations can be indicated on a single tissue overlay.

b. Handling process color—Paste a photocopy of the original art in position on the base sheet and indicate that it is to be printed in process color.

Note: It is not necessary to use an acetate overlay with process color. If there is line copy to be printed in color along with the full-color image, specify the color.

c. Preparing overlays for screen tints

- Tape ruby film in register over paste-up.
- Cut top layer of ruby film with X-Acto knife and peel away from clear film base all areas except those to be printed.
- Prepare ruby film overlay for each screen tint area to be printed.

Note: When photographed, ruby film material reproduces as black, resulting in clear area on film negative.

d. Preparing dropouts

Note: A dropout eliminates unwanted portions of a photo or drawing without damaging original copy.

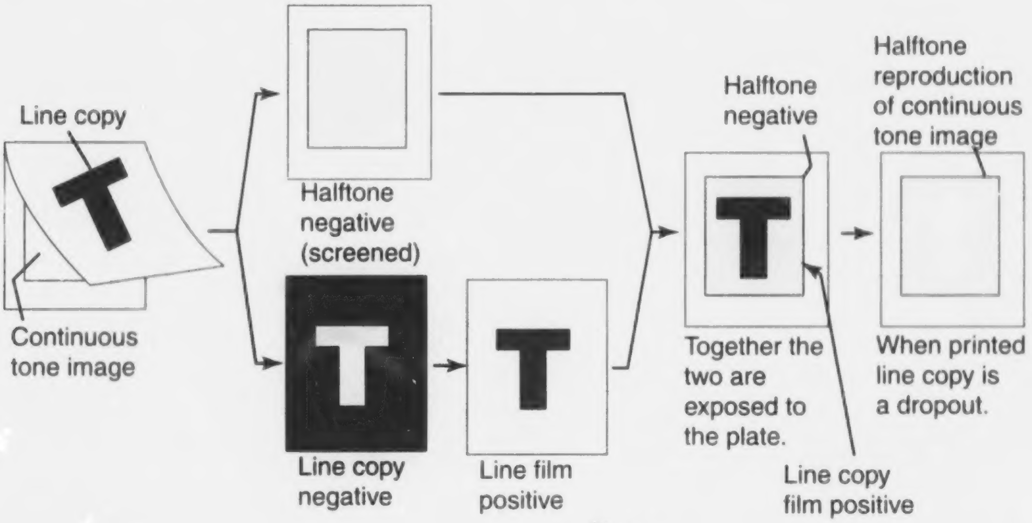
- Tape ruby film in register over the artwork.

Note: Film negative can be used instead of original copy when preparing overlay of ruby film.

- Cut top layer of ruby film with X-Acto knife and peel away from clear film base area to be printed.

Note: Ruby film can be used as a mask and stripped up on the same flat with film negative.

Figure 22


Line copy
Continuous tone image
Halftone negative (screened)
Line copy negative
Line film positive
Halftone negative
Together the two are exposed to the plate.
Line copy film positive
Halftone reproduction of continuous tone image
When printed line copy is a dropout.
T

e. Preparing windows

Note: Use of ruby film is an accurate method of preparing windows for halftone negatives, particularly when line and halftone are very close together. Preparation of multiple windows in a row is more accurate and neater with ruby film than with the use of paste-up windows.

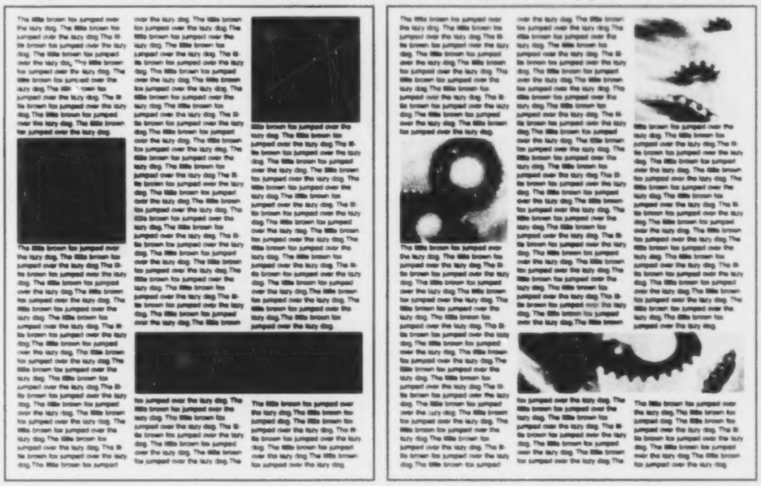
- Place guidelines on base sheet showing location of photographs.
- Place ruby film over base sheet.

  Note: Ruby film is transparent, allowing guidelines to be followed when cutting windows with knife.

- Cut ruby film material, then peel away from all areas except where photographs will appear.
- Paste up line copy on base sheet.

  Note: Both windows and line copy can be photographed in one exposure. Halftones of the photographs are then combined with the line negative on one flat. Separate flats are often necessary when line copy and photographs are very close together. In this instance, the halftones are stripped into the windows on one flat, while the line copy is stripped onto another flat. An exposure of each flat to the same plate is then made.

Figure 23



Ruby film covers photo area

Paste up line copy on base sheet

BEST COPY AVAILABLE

Information Sheet

Objective 6

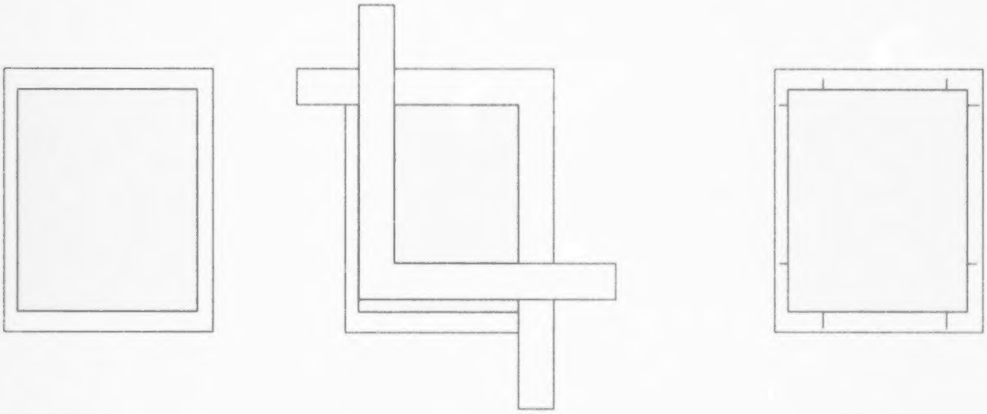
Processing art for production

a. Cropping

- Uses
  - — To make art fit a particular layout
  - — To eliminate unnecessary portions of art
  - — To change shape of art
  - — To improve or emphasize desired portion of art
- Method
  - — Place cropper's Ls or strips of paper around art to mask out undesired portion.
  - — Mark where art is to be cropped with a grease pencil in the margin.

  Note: Do not mark on the face of the original artwork.

Figure 24



Original

Determining desired portion

Marked for cropping

b. Scaling—Equivalent to copyfitting; art must be prepared to fit the size of the sheet or space on which it will be printed.

- Enlarging

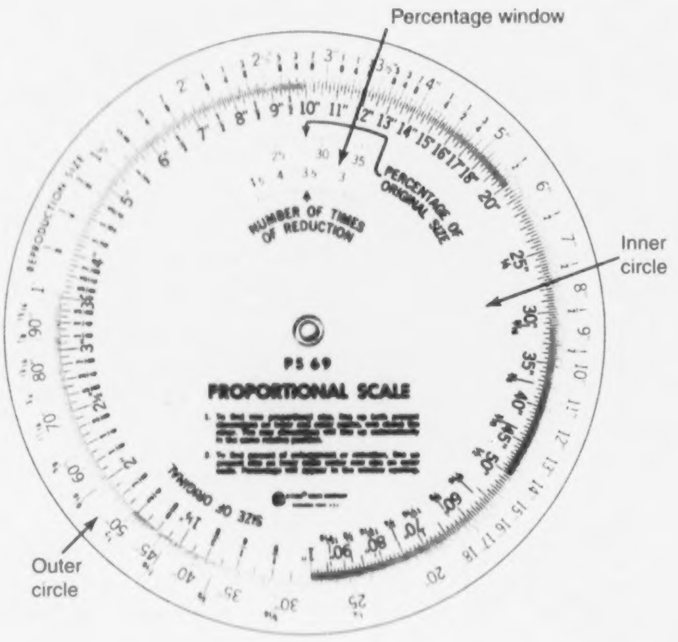
  Note: Enlarging magnifies flaws in original copy.

- Reducing

  Note: Reducing shrinks fine lines or dot patterns that may end up too thin to print.

- Methods
  - Using a proportional scale
    - Measure copy.
    - Measure available space.
    - Find width of original copy on inner circle of proportional scale.
    - Line up width of original with size wanted on outer circle.
    - Read in window the reduction or enlargement percentage.
    - Repeat this operation for height.
    - Use lowest percentage figure when shooting copy if it is to be a reduction.
    - Use highest percentage figure when shooting copy if it is to be an enlargement.

Figure 25

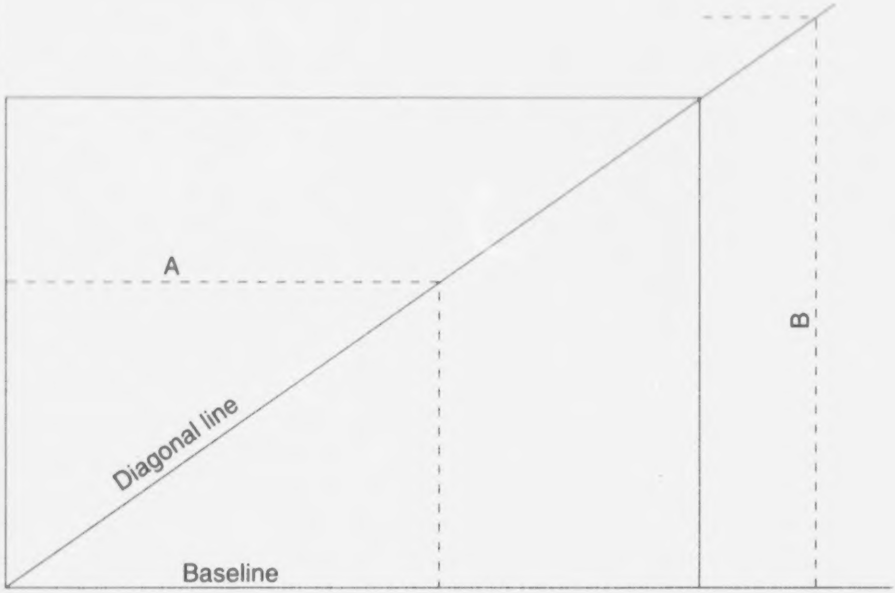

Percentage window
Inner circle
Outer circle
PERCENTAGE OF ORIGINAL SIZE
NUMBER OF TIMES OF REDUCTION
REPRODUCTION SIZE
SIZE OF ORIGINAL
PS 69
PROPORTIONAL SCALE

BEST COPY AVAILABLE

- Using diagonal line
  - Draw rectangle or square the same size as original copy.
  - Draw diagonal line through corners.
  - Measure desired width of scaled copy on baseline.
  - From this point, extend line upward until it crosses diagonal line.
  - Point of intersection will be new height of scaled copy.

Note: Camera copy is often referred to as an enlargement even though it is actually a reduction, i.e., a .75 enlargement would really be 3/4 original size copy.

Figure 26



Note: The solid rectangle indicates the size of the original copy, 2 3/4″ h x 4″ w. Broken line A shows reduction in height to 1 3/4″, and shows new width. Broken line B shows enlargement of width to 4 3/4″, and shows new height.

545

— Using the formula $\frac{W}{H} = \frac{w}{h}$

Note: W = original width, w = width of enlargement or reduction, H = original height, h = height of enlargement or reduction.

- Substitute actual dimensions into formula.

  Note: Assume the original art is 8″ wide by 4″ high and the space available allows for a 3″ height.

  $\frac{W}{H} = \frac{w}{h}$ or $\frac{8}{4} = \frac{w}{3}$

- Cross multiply.

  $\frac{8}{4} = \frac{w}{3}$ or $4w = 24$

- Solve the equation.

  $4w = 24$ or $w = \frac{24}{4}$ or $w = 6''$

- Specify scaling instructions on a sticker indicating percentage at which copy should be reproduced: 100% for same size, less than 100% for reductions, and over 100% for enlargements.

  Note: Time and money can be saved by shooting all images to be done in the same percentage at one time, but ganging may cause some loss of quality if originals differ in contrast or density.

Objective 7

Kinds of imposition

Note: When producing books, booklets, magazines and other such publications, several pages are ordinarily printed on a single sheet of paper. Each sheet may contain 4, 8, 16, 32, or 64 pages. After printing and folding, these pages must fall in the correct sequence. Each printed and folded sheet is called a signature. Imposition is dictated by press capacity, the number of pages involved, and folding and binding.

a. Printed-one-side (P1S)

- As name implies, prints one side of sheet with each pass through press.
- Ganging P1S impositions allows more than one job to be printed at a time.

  Note: Sheet size, color, and quantity must be considered when ganging.

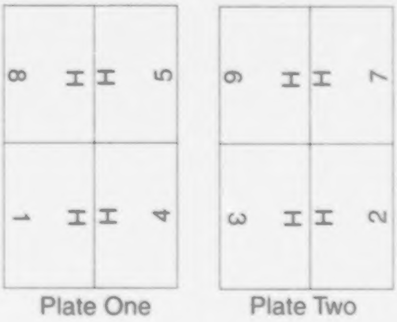
b. Sheetwise

- Also referred to as *work and back*, *print and back*, and *front and back*.
- Requires two plates, one to print front side of the press sheet, and one to print back.

  Note: These may be multiples of two.

- Uses same gripper edge for both plates.

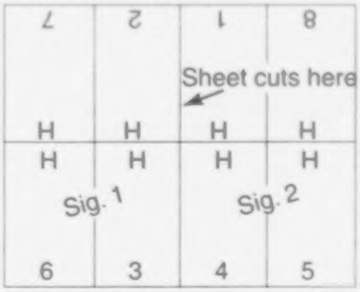
Figure 27—A one-up, sheetwise, 8-page imposition


8
H
H
5
1
H
H
4
6
H
H
7
3
H
H
2
Plate One
Plate Two

c. Work and turn

- Also referred to as *print and turn*
- All pages of signature are on one plate, outer form on one half and inner form on one half the plate.
- Two complete copies per each sheet are produced.
- Same gripper edge, both press runs

Figure 28—A one-up, work and turn, 8-page imposition

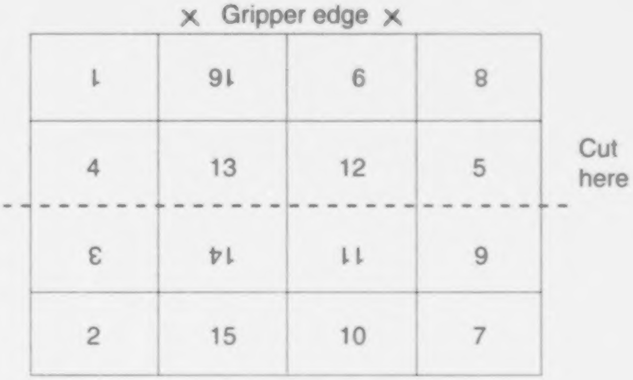

7
2
1
8
Sheet cuts here
H
H
H
H
H
H
H
H
Sig. 1
Sig. 2
6
3
4
5

547

d. Work and tumble

- Also referred to as *work and roll*, or *work and flop*.
- All pages are on one plate.
- Uses different gripper edge both runs.
- Two complete copies, or multiples of two, per each sheet are produced.

Figure 29—A 16-page work and tumble imposition



Objective 8

Postal regulations

a. Standard size

- Minimum—3 1/2" high x 5" long
- Maximum—6 1/8" high x 11 1/2" long
- Length may not be more than 2.5 times or less than 1.3 times the height.
- Pieces under minimum or over maximum are mailable with a surcharge.

b. Standard weight and thickness

- Minimum—.007 inches thick with minimum size
- Maximum—.25 inches thick with maximum size

c. Business reply cards

- Permit must be obtained from U.S. Postal Service.
- U.S. Postal Service specifications and negatives must be used.

d. Third-class bulk mail

- Annual fee charged
- Special rates for certain nonprofit organizations

  Examples: Religious organizations, educational organizations

- Prepaid postage required
- Indicia—Imprinted designations used in mail pieces to denote payment of postage
- Minimum—200 pieces or 50 pounds of material of identical size and weight

  Note: Contact your Postmaster or Customer Service Representative for more details. There is no charge for mail piece assessment services.

Objective 9

Job Sheet 1—Prepare a Paste-Up

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Directions were followed	______
• Organized tools and materials	______
• Taped base sheet square on table	______
• Drew trim marks and folding lines on base sheet	______
• Trimmed excess paper from elements	______
• Pasted line copy and continuous tone copy in layout position	______
• Applied borders, rules, and finishing touches	______
• Burnished entire sheet and covered paste-up with overlay	______

Basic Skills

Reading

Critical Thinking

Introduction

Increasingly "paste-up" work is being done on computer screens through page-layout programs. Still, there are places where paste-ups are done manually so it will benefit students of graphic arts to actually do paste-up work by hand. This exercise will give you experience with the tools of paste-up.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- Drawing board or light table
- T-square
- Triangle
- Line gauge or metal ruler
- Masking or drawing tape
- Grid or base sheets
- Nonreproducing light blue pencil or pen
- Fine-tipped black pen
- Erasers
- X-Acto knife
- Trimboard
- Waxer, rubber cement, or other adhesives
- Burnishing roller
- Opaque white paint or correction fluid
- Mechanical films
- Tissue or tracing paper
- Copy and layout furnished by instructor

Job Sheet 1

Procedure

☐ 1. Look over layout or dummy.

☐ 2. Organize all tools and materials.

☐ 3. Using T-square as guide, tape base sheet square on table.

☐ 4. If not using preruled sheet, draw light blue (nonreproducible) guidelines on base sheet.

☐ 5. Using fine-tipped black pen, draw trim marks and dotted folding lines on base sheet.

☐ 6. Trim excess paper from elements.

☐ 7. Working from the top downward, paste down line copy on base sheet in position indicated on layout or dummy.

Note: Use T-square and triangle on each element as you place it to make sure it is straight and aligned.

☐ 8. Position and paste down continuous-tone copy.

Note: If halftones are made as film negatives, they need only be indicated for size and position. Indicate position by drawing a red holding line or pasting down opaque red or black blockout film. If halftone paper prints are used, they are handled like line copy.

☐ 9. Apply borders, rules, and other finishing touches.

☐ 10. Lay protective sheet over page and burnish entire surface with roller.

☐ 11. Cover finished paste-up with tissue or tracing paper overlay.

☐ 12. Recheck the paste-up, make sure it is clean and neat, write instructions to printer.

Note: To get an idea of how the printed piece will appear, make a photocopy of the paste-up.

☐ 13. Place name on back of paste-up and turn in for evaluation.

☐ 14. Clean work area and return equipment and materials to proper storage.

Evaluator's Comments: ______________________________

____

____

Objective 10

Job Sheet 2—Prepare Overlays Using Clear Acetate and Ruby Film

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Directions were followed	______
• Mechanical color overlays are in proper position, in register, and correctly labeled	______
• Screen tint overlays in proper position, ruby film carefully and accurately cut, and properly peeled from area to be screened	______
• Dropouts in proper position, ruby film carefully and accurately cut, and properly peeled from area to be printed	______
• Windows in proper position, square and aligned, ruby film cut carefully and accurately and peeled from all but photo positions	______
• Cleaned work area after submitting work to instructor	______

Basic Skills

Reading

Critical Thinking

Introduction

This exercise will acquaint the student with the precision necessary for a successful paste-up job using clear acetate and ruby film, common tools of the printing trade.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- Drawing board or light table
- T-square
- Triangle
- Line gauge or metal ruler
- Masking or drawing tape
- Grid or base sheets
- Nonreproducing light blue pencil or pen
- Fine-tipped black pen
- Register marks
- X-Acto knife
- Trimboard
- Rubber cement or other adhesives
- Burnishing roller
- Clear acetate film and ruby film
- Copy and layout furnished by instructor

Procedure

☐ 1. Mechanical color overlays

  ☐ a. Paste the black (or major color) copy to the base sheet. (Refer to Job Sheet 1, if necessary.)

  ☐ b. Cut, on trimboard, a piece of clear acetate to the same size as grid or base sheet for each additional color to be used.

  ☐ c. Tape acetate in register over base sheet.

  ☐ d. Using rubber cement or other adhesive, paste down elements to be printed in color on acetate in position indicated by layout or dummy.

  ☐ e. Give instructions on base sheet and each overlay showing the desired color.

  ☐ f. Check work for accuracy, then turn in for evaluation.

☐ 2. Screen tint overlays

  ☐ a. Cut on trimboard, a piece of ruby film to the same size as base sheet to be used.

  ☐ b. Tape ruby film, clear base side down in register over base sheet.

  ☐ c. Using X-Acto knife, carefully outline area that is to be screened.

> **Caution:** Use extreme care to avoid cutting through ruby film base and damaging photo or illustration. A few practice cuts on ruby film scraps would be helpful in avoiding this type of mistake. Or, for added protection, place clear acetate between ruby film and grid or base sheet while cutting.

  ☐ d. Peel away all areas of ruby film except that which is to be screened.

  ☐ e. Check work for accuracy then turn in for evaluation.

☐ 3. Dropouts

  ☐ a. Cut, on trimboard, a piece of ruby film to the same size as photograph or illustration to be used.

  ☐ b. Place ruby film, clear base side down, over photo and tape in place along top edge.

☐ c. Using X-Acto knife, carefully outline area that is to be dropped out.

> **Caution:** Use extreme care to avoid cutting through ruby film base and damaging photo or illustration.

☐ d. Carefully peel away the portion of the ruby film from the area of the photo that will be printed.

☐ e. Check work for accuracy, then turn in for evaluation.

☐ 4. Windows

☐ a. Using T-square as guide, place base sheet on layout table and tape in place.

☐ b. Mark, with light blue pencil, location of photographs on the base sheet.

☐ c. Cut, on trimboard, a piece of ruby film to the same size as base sheet.

☐ d. Place ruby film, clear base side down, over base sheet and tape in place along top edge.

☐ e. Using T-square, triangle, and X-Acto knife, carefully cut locations of photographs in the ruby film.

> **Caution:** Use extreme care to avoid cutting through film base.

☐ f. Peel away all areas of ruby film except that which will be printed as photographs.

☐ g. Check all windows on ruby film for squareness and proper location.

☐ h. Turn in for evaluation.

☐ i. Clean work area and return equipment and materials to proper storage.

Evaluator's Comments: ______________________________

____

____

Objective 11

Job Sheet 3—Crop a Photograph

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Directions were followed	______
• Horizontal and vertical crop marks accurately drawn in photo margins	______

Basic Skills

Reading

Critical Thinking

Introduction

Seldom will photos used in printing jobs be the correct size or proportion. This exercise will acquaint you with proper cropping methods to ensure the photo you are reproducing will fit the space you need and carry the proper instructions to the printer for ease of handling.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- China marking pencil
- Ruler or line gauge
- T-square
- Triangle
- Sheet of translucent tracing paper
- Four strips of paper approximately 3″ x 8″ or two cropper's Ls
- Masking or drafting tape
- Photograph furnished by instructor

Procedure

☐ 1. Using strips of paper or cropper's Ls to cover portions of photo, select portion of photo to be reproduced.

☐ 2. Using the ruler or line gauge and marking pencil, mark two sets of horizontal lines in the side margins of the photo, showing the desired area.

☐ 3. Mark two sets of vertical lines in the top and bottom margins of the photo showing the desired area.

☐ 4. Turn in for evaluation by instructor.

Note: Crop marks may be easily removed for future recropping.

☐ 5. Clean work area and return equipment and materials to proper storage.

Evaluator's Comments: ______________________________

____

____

556

Objective 12

Job Sheet 4—Scale Copy

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation Criteria	Rating
• Directions were followed	______
• Scaled copy using a proportional scale	______
• Scaled copy using diagonal line method	______
• Scaled copy using formula method	______
• Copy was accurately scaled according to art and layout provided	______

Basic Skills

Reading Mathematics Critical Thinking

Introduction

When pasting up any print job it is imperative that one know how much copy space will be needed. This exercise will acquaint you with scaling copy using three different methods.

Instructions

When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Tools, equipment, and materials

- T-square
- Triangle
- Proportional scale (wheel)
- Ruler or line gauge
- Pencil or pen
- Illustration or halftone copy and dummy or layout furnished by instructor
- Several sheets of blank paper
- Masking or drafting tape

Procedure

Note: Scaling of copy will be accomplished using three different methods.

☐ 1. Proportional scale method

  ☐ a. Using ruler or line gauge, carefully measure copy for both width and height.

  ☐ b. Measure space available on layout for copy.

  ☐ c. Find the width of the copy to be scaled on the inner circle of the proportional scale.

  ☐ d. Line up the original size with the desired size on the outer circle of the proportional scale.

- ☐ e. Read, in the window of the proportional scale, the percentage of the desired reduction or enlargement.
- ☐ f. Leave the scale set on this percentage and read on the outside circle what the reduced or enlarged height will be.
- ☐ g. Write the percentage and the desired size on a sheet of paper, attach to the copy, and turn in for evaluation.

☐ 2. Diagonal line method

- ☐ a. Using T-square, align sheet of paper straight on table and tape in place.
- ☐ b. Using the T-square, triangle, and line gauge, draw outline form the same size as copy you are scaling.
- ☐ c. Draw a diagonal line from the lower left corner through the upper right corner and continue the line across the page.
- ☐ d. Measure the desired width across the bottom of the first rectangle, and from that point draw a vertical line until it intersects the diagonal line.
- ☐ e. Measure the point of intersection; this will be the new height of scaled copy.
- ☐ f. Write the desired size beside the diagonal line drawing and turn in to be evaluated.

☐ 3. Formula method

- ☐ a. Using ruler or line gauge, carefully measure copy for both width and height.
- ☐ b. Measure space available on layout for copy.
- ☐ c. Using the formula W/H = w/h, and substituting the width of copy, determine the new width and height of copy for layout.
- ☐ d. Write the new width and height and turn in to instructor for evaluation.
- ☐ e. Clean work area and return equipment and materials to proper storage.

Evaluator's Comments: ______________________________

____

____

Proof Procedures and Legal Considerations

Unit Contents

Student Components

Student Page

Objective Sheet 11–3

Information Sheet 11–5

Assignment Sheet

1—Read and Mark Proof Copy 11–15

Objective Sheet

Unit Objective

After completing this unit, the student should be able to proof copy and recognize the existence of legal restrictions on the printer. The student should demonstrate these competencies by completing the assignment sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to proof procedures and legal considerations with their definitions.
2. Select true statements concerning reasons for pulling proofs.
3. Distinguish among types of proofs.
4. Match proofreaders' marks with their meanings.
5. Select true statements concerning reading, marking, and correcting galley proofs.
6. Select true statements concerning legal restrictions.
7. Name the three elements of copyright notice.
8. Select true statements concerning the tests for judging the "fair use" of copyrighted material.
9. Select from a list items that may be copyrighted.
10. Select from a list items not eligible for copyright.
11. Select true statements concerning provisions for using photographs of people for advertising purposes.
12. Read and mark proof copy. (Assignment Sheet 1)

Information Sheet

Objective 1

Terms and definitions

a. **AA** (author's alteration)—Any change in a proof not caused by typesetter's or printer's error; the author pays the charges

b. **Copyright**—Form of protection given by law to authors of literary, dramatic, musical, artistic, and other similar works

c. **Counterfeiting**—Making an imitation or copy of a genuine article (money, painting, etc.) with the intent to deceive

d. **Fair use**—A limitation on the exclusive rights of copyright owners

e. **Infringement**—Using copyrighted material in such a way as to reduce the profits that would otherwise be received by the copyright holder

f. **Libel**—A written or pictorial statement that conveys an unjustly unfavorable impression

g. **Path line**—A line drawn from error in proof to symbol for error in nearest margin

h. **PE** (printer's error)—Any change made because of printer or typesetter error

Note: The designation TA (typesetter alteration) may also be used.

i. **Pornography**—Writing or illustrations considered obscene

j. **Proof**—A trial reproduction of type and illustrations to reveal errors or flaws

k. **Proof OK**—Customer signature approving a proof and authorizing the job to advance to the next stage

l. **Proofreader marks**—Symbols and abbreviations used by proofreaders to indicate corrections necessary in the proof

m. **Proofreading**—Reading copy on a proof and marking any errors or flaws for correction

Objective 2

Reasons for pulling proofs

a. Every job should be checked and double-checked by both the printer and customer—this is the only way to verify that typesetting, the paste-up, negatives, flats, and plates are accurate and complete.

Note: Inquire about anything that seems wrong.

b. Proofs help determine who is responsible for mistakes and should pay for correcting them.

Note: Printers and customers each pay for their own mistakes. Typesetters accept responsibility for their errors, but charge for time spent correcting errors that were not detected in original copy or remaking lines for customers who have merely changed their minds.

c. After examining a proof, the customer decides whether to approve it or ask for another proof; if it is OK'd, the customer authorizes the next stage in the production sequence.

Note: Approved, signed, and dated proofs should be kept as a record.

Objective 3

Types of proofs

a. Galley proof—When copy has been set into type, "galleys" are read to detect and eliminate errors made by the typesetter.

Note: Before the proof is sent to the customer it is first proofread in the shop. This is the time to make changes, if needed; if made later, they will be more costly.

- Visual editing—Operator reads copy on computer screen, checking for errors, changes, or omissions, and by use of a cursor, locates and corrects the copy.
- Cold type composition
  - — Phototypesetting or computer shops make photocopies or plain bond, laser printouts of galley proofs, and corrections are marked on these paper positives.
  - — Photocopies are made of typewritten, hand-lettered, and transfer lettered work and used for proofreading and marking.
- Hot type composition
  - — Line-casting and foundry type forms are inked and proof is pulled on proof press.
  - — Proof is pulled on newsprint paper larger than type to leave room for marking corrections.
- Revised—New mistakes can slip in when old ones are corrected—revised galley proofs provide protection for printers and customers by permitting detection of errors made during corrections before material has been put in page form.
- Duplicate—Some customers require duplicate sets of galley proofs: one for marking corrections (on white paper) and the other to be cut apart and pasted on layout sheets (sometimes on colored stock).

b. Page proof—Provides a chance to check if the material is positioned and aligned properly, if headlines are with the right text, if captions are with the correct picture, and so on.

- A photocopier is often used to make a proof of a paste-up.
- Proofs of paste-ups are necessary.
  - — To prevent handling the original paste-up while verifying its accuracy
  - — To eliminate the distraction of guidelines and trimmed edges of pasted pieces so that image straightness and spacing can be checked
  - — To provide a file copy of the page
- Any corrections needed can be marked on the page proof.

c. Bluelines or brownline proof—Prepress, photographic replica in blue or brown of all pages in a printed job that is used if there are overlays, halftones, reverses, tints, or anything that will not show on a photocopy.

- Check to see that everything was stripped correctly.
- Proof illustrations.
  - — Check dimensions; negatives must fit their space.
  - — Look for imperfections like photos with jagged edges, unsightly scratches, blemishes, and spots.
  - — Examine content; make sure photo is cropped and scaled properly and faces in proper direction.
  - — Check if halftone exposure is too gray or has too much contrast.
  - — Watch for paper clip marks on edge, faint handwriting on surfaces, or cracks from folded photos.
- Stick pages together back-to-back for two-sided jobs, fold, trim, staple, and check page sequence.

  Note: Don't leave anything to chance.
- When proofing simple two-color jobs, color differences can be indicated by varying exposure time.
- Write instructions directly on proof.

d. Color proof—Intended primarily for color separations.

Note: Overlay methods such as Imation's Color-Key, laminated overlays like DuPont's Cromalin, and progressive proofs (progs), are examples of traditional color proofing systems.

- Color proofing materials are expensive.
- Costly separations may be avoided by use of electronic soft copy previewing; computers and scanners allow the operator to manipulate the color image.

e. Press proof—Proof made on press using the plates, paper, and ink specified for the job

- Costly in both time and money
- Used primarily for premium four-color printing jobs

f. Digital proof—Proof made by outputting electronic files on a high-resolution, high-quality printer

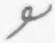
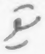
Note: As more of the industry moves to computer-to-plate workflow, digital proofing has become extremely important. For digital proofs to replace film-generated proofs, they must accurately represent all the features of the traditional proof including color fidelity, traps, and overprints, representative screening, and quality in fine line details.

- Dye-sublimation printers and ink-jet printers
  - Simulate both process inks and spot colors
  - Produce dotless color images that closely simulate the press sheet
  - Much less expensive to produce than conventional proofs
- Electrostatic printers and high-quality printers/copiers
  - Simulate the printing inks of a press
  - Commonly used for proof production
- Digital bluelines
  - Two-sided digital position proofs for eight-page impositions usually printed on wide format ink jet proofers
  - Allow proofs to output in full color or in single color to check basic layout and imposition
  - Can produce two-sided signature proofs

Objective 4

Proofreaders' marks

Note: Proofreaders' marks are often called a printer's shorthand.

a.		— Delete
b.		— Delete and close up
c.		— Turn inverted letter
d.	⁐	— Close up
e.	#	— Insert space
f.	√√√	— Equalize spacing
g.	less#	— Reduce spacing
h.	¶	— Paragraph
i.	□	— Indent one em
j.	[	— Move to left
k.	]	— Move to right
l.	⊔	— Lower
m.	⊓	— Elevate
n.	∧	— Insert marginal addition
o.	X	— Broken letter
p.	⊥	— Push down space
q.	=	— Straighten
r.	‖	— Align type
s.	$\overset{,}{\wedge}$	— Insert comma
t.	$\overset{'}{\vee}$	— Insert apostrophe
u.	$\overset{''}{\vee}$	— Insert quotes
v.	(/)	— Insert parentheses
w.	[/]	— Insert brackets
x.	$\underset{3}{\wedge}$	— Insert inferior figure
y.	$\overset{3}{\vee}$	— Insert superior figure
z.	=/	— Hyphen
aa.	|em|	— Em dash
bb.	|en|	— En dash
cc.	;/	— Insert semicolon
dd.	:/	— Insert colon
ee.	⊙	— Insert period
ff.	?/	— Insert question mark

gg.	(?)	— Query to author
hh.	⌢	— Use ligature
ii.	(sp)	— Spell out
jj.	tr	— Transpose
kk.	set 1, 2, 3	— In this order
ll.	wf	— Wrong font
mm.	bf	— Set in bold face type
nn.	rom	— Set in roman type
oo.	ital	— Set in italic type
pp.	Caps	— Set in capitals
qq.	sc	— Set in small capitals
rr.	lc	— Set in lowercase
ss.	B̸	— Lowercase letter
tt.	stet	— Let it stand
uu.	no¶	— Run in same paragraph
vv.	ld>	— Insert lead between lines
ww.	hr#	— Hair space between letters
xx.	out sc	— Out–see copy
yy.	#	— End of copy

Objective 5

Reading, marking, and correcting galley proofs

a. Read—To discover errors and flaws

- Check spelling.
- Check grammar.
- Check punctuation.
- Check capitalization.
- Check figures.
- Check indentions and paragraphs.
- Check mark-up instructions for match to typeset copy.

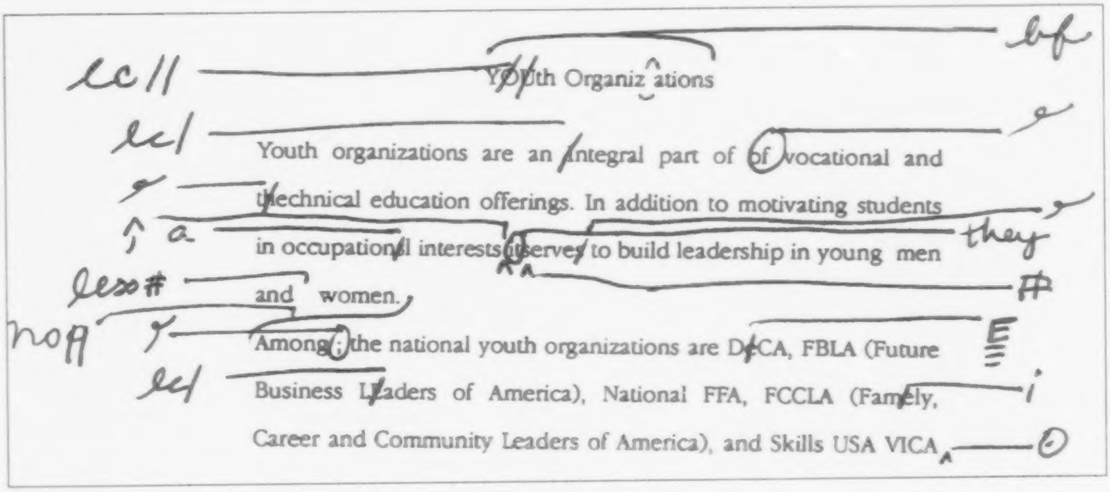
Note: Proofreading sometimes is done by two people, a copyholder holds the copy and reads the original manuscript aloud to the proofreader who watches the proof closely for errors and marks necessary corrections.

b. Mark—To denote each error on proof

Note: Make sure corrections are legible.

- Path line method of marking

Figure 1



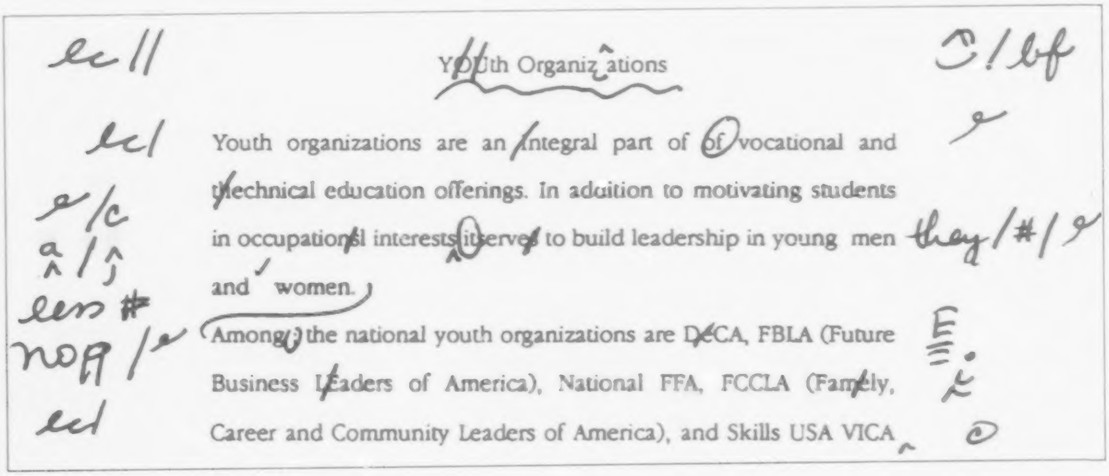
YOUth Organiz ations

Youth organizations are an Integral part of of vocational and thechnical education offerings. In addition to motivating students in occupationl interests it serves to build leadership in young men and women.

Among; the national youth organizations are DeCA, FBLA (Future Business Leaders of America), National FFA, FCCLA (Famely, Career and Community Leaders of America), and Skills USA VICA

- Corresponding margin marks method

Figure 2



YOUth Organiz ations

Youth organizations are an Integral part of of vocational and thechnical education offerings. In addition to motivating students in occupationl interests it serves to build leadership in young men and women.

Among; the national youth organizations are DeCA, FBLA (Future Business Leaders of America), National FFA, FCCLA (Famely, Career and Community Leaders of America), and Skills USA VICA

c. Correct

- Cold type composition
  - — Reset a whole word, line or paragraph, not just a character.
  - — Check to be sure new type is a perfect match.
  - — Using light table, paste correction over error; then burnish it well.

    Note: If layout table is used, use T-square to check correction for straightness.
- Hot type composition
  - — Reset complete line.
  - — Exchange corrected lines for lines with errors.

Objective 6

Legal restrictions

a. Considerations for the printer and customer

- Printers and customers must be on guard to prevent becoming involved in legal matters relating to copyrighting, counterfeiting, and pornography.
- Generally speaking, a person is libeled when he or she is identified in a publication that defames (damages) him or her by exposing him or her to public hatred, contempt, or ridicule.
- Photographs can be defamatory when they cast a "false light" on an individual or group.
- Since law changes rapidly, continued reading in this area is necessary.

b. U.S. copyright law

- A new copyright law went into effect on January 1, 1978.
- The purpose of copyright is to secure for the creator of the material all the benefits earned by creating it.
- The U.S. law now parallels the international agreement followed by most of the leading countries of the world.
- Work copyrighted after January 1, 1978, is protected for the author's lifetime plus 70 years.
- "Works made for hire" have copyright protection 95 years from the first year of publication or 120 years from the year of creation, whichever is shorter.
- The new copyright law defines "fair use" of material and "infringement of copyright."

Objective 7

Elements of copyright notice

a. The word "Copyright," the abbreviation "Copr.," or the symbol ©

b. The name of the copyright owner

c. The year of first publication

Note: Further information on copyright law may be obtained by writing to the U.S. Copyright Office, Library of Congress, 101 Independence Avenue S.E., Washington, D.C. 20559-6000, or by visiting the U.S. Copyright Office website at http://www.loc.gov/copyright.

Objective 8

Tests for judging the "fair use" of copyrighted material

a. The purpose and character of the use

Examples: The use for profit; for educational purposes

b. The nature of the copyrighted works

c. The amount of material used in relation to the total material

d. The effect of the use on the commercial market value of the material

Objective 9

Items that may be copyrighted

a. Books

b. Brochures

c. Catalogs

d. Leaflets

e. Pamphlets

f. Greeting cards

g. Single pages

h. Newspapers

i. Magazines

j. Maps

k. Drawings

l. Paintings

m. Photographs

n. Musical compositions

o. Labels

p. Film strips

q. Motion pictures

Objective 10

Items not eligible for copyright

a. Names

b. Titles

c. Slogans

d. Familiar symbols

e. Familiar designs

f. Time cards

g. Account books

h. Calendars

i. Rulers

j. Sporting event schedules

k. Graph paper

l. Material from U.S. Government

Objective 11

Provisions for using photographs of people for advertising purposes

a. Written permission (model release) must be obtained if faces are recognizable.

b. In using pictures of children (minors), written permission of legal guardian must be obtained.

c. Failure to obtain written permission may result in claim of invasion of privacy and demand for payment.

Objective 12

Assignment Sheet 1—Read and Mark Proof Copy

Name ______________________________ Overall Rating __________

Date ______________________________

Evaluation Criteria	Rating
• Directions were followed	______
• Marked copy with appropriate proofreaders' marks to the satisfaction of the instructor	______

Basic Skills

Reading Writing

Introduction

Proofreading is an important skill and step in the production process. This exercise will give the student the opportunity to read and mark copy using the path line method.

Directions

Read and mark the copy below with appropriate proofreaders' marks, using the path line method.

Proofreading is the art of checking cop y fore errors and indicating the corrections to be made. Ideally, proofreading is done by two peoples. One is the *copy holder* who reads aloud fromthe original copy to the proofreader. The other, called the *proofreader*, follows the reading proof and marks any corrections necessary.

Sometimes, however, the proofreader werks alone, checking the original copy against the proof.

Proofreaders marks (also proof marks) are the symbols used bythe proofreader to indicate the corrections necessary *in* the proof. Examples of the msot commonly used proof marks are shown on the following page